COMPARING THE EFFICACY OF OPEN CHAIN EXERCISE VERSUS CLOSED CHAIN EXERCISE IN REDUCING PAIN AND IMPROVING THE FUNCTIONAL STATUS IN PATIENTS WITH ROTATOR CUFF TENDINOPATHY

Dissertation submitted

in partial fulfillment

For the degree of

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(ORTHOPAEDICS)

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Chennai

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PSG COLLEGE OF PHYSIOTHERAPY

Coimbatore

PSG COLLEGE OF PHYSIOTHERAPY

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CERTIFICATE

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Internal examiner **External examiner**

Date of evaluation:

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DEDICATED TO MY EVER-LOVING

PARENTS AND MY DEAR BROTHERS

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ABBREVIATIONS

SIS	-	Shoulder Impingement Syndrome
RC	-	Rotator Cuff
OCE	-	Open Chain Exercise
CCE	-	Closed Chain Exercise
VAS	-	Visual Analogue Scale
WORC	-	Western Ontario Rotator Cuff Index
PRE	-	Progressive Resisted Exercise

CONTENTS

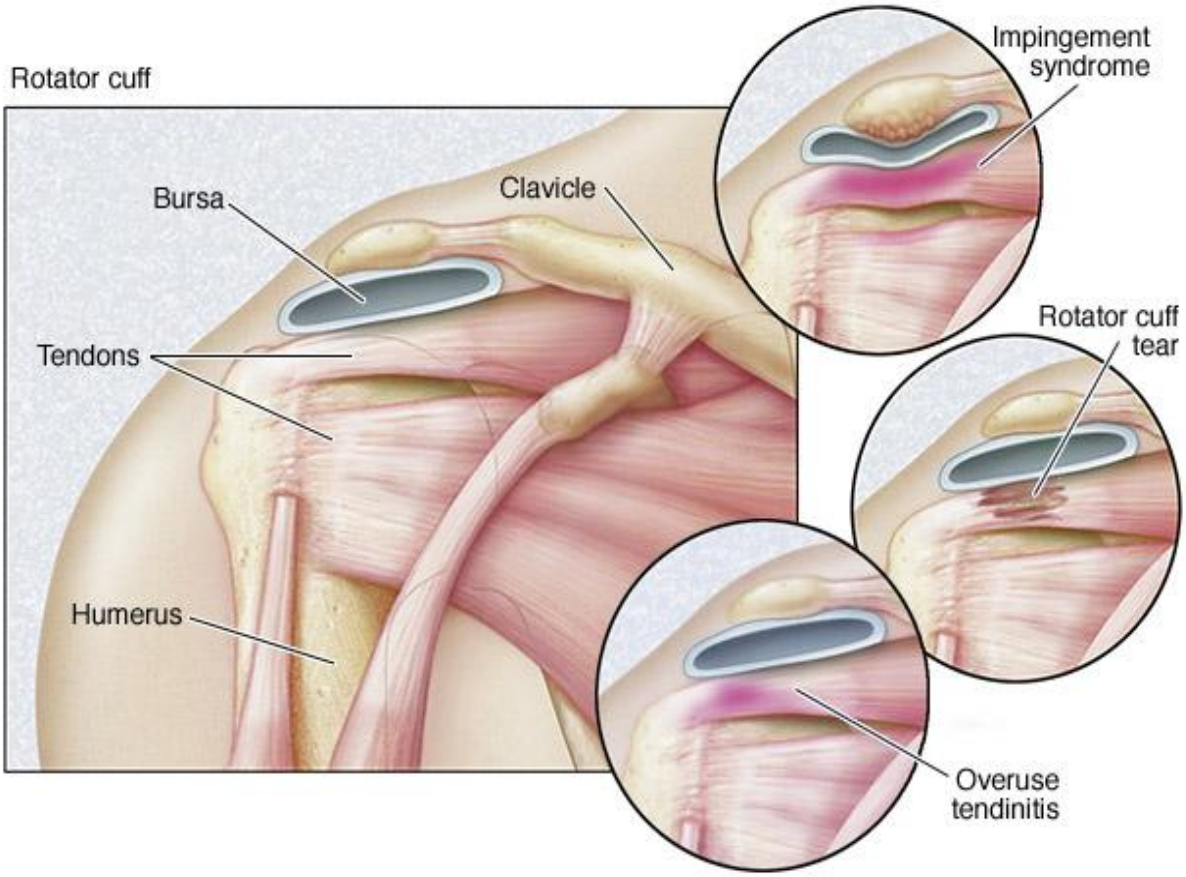
LIST OF ANNEXURES

CHAPTER-I

INTRODUCTION

Shoulder pain is the third most common musculoskeletal complaint encountered in clinical practice[1]. Prevalence studies indicate that 16 to 34 percent of the general population suffers from shoulder pain. In working populations, the incidence of shoulder-related symptoms may be as high as 14 to 18 percent [2].

One of the most common causes of shoulder pain is rotator cuff (RC) tendinopathy /shoulder impingement syndrome (SIS)[3]. The syndrome has been described by Neer as impingement of the rotator cuff tendons against the anterior edge and undersurface of the anterior third of the acromion, the coracoacromial ligament, and at times the acromioclavicularjoint[1].



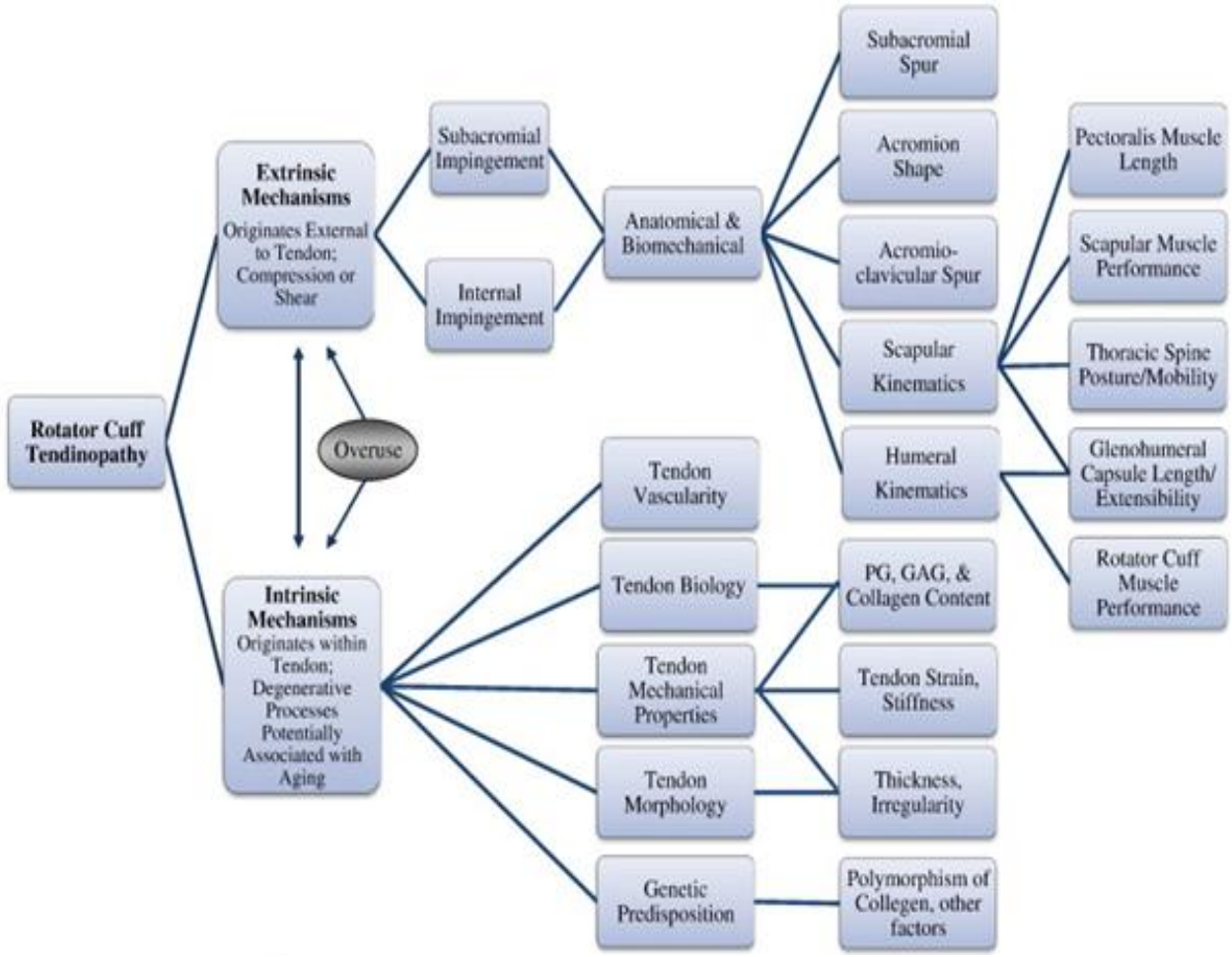
Tendons are interposed between muscles and bones, and transmit the force created in the muscle to the bone which, in turn, enables joint movement[4]. Tendinopathy is a term usually used for all pain conditions in and around the tendon. The causes of the tendinopathies include, both the intrinsic (anatomical variants and alterations, muscle tightness/imbalance/weakness, nutrition, age, joint laxity, systemic disease, vascular perfusion, overweight and all conditions linked to apoptosis) and the extrinsic factors (occupation, physical load and overuse, technical errors, inadequate equipment and environmental conditions) which is contributing to the pathologic processes.[5-7]

Excessive mechanical loading is considered the major cause of rotator cuff tendinopathy. Tendon injuries in the shoulder account for overuse injuries in sports as well as in jobs that require repetitive activity. Although tendon problems are very frequent, they are not always easy to manage[8]. Lesions of the rotator cuff typically start where the loads are presumably the greatest at the deep surface of the anterior insertion of the supraspinatus.[9] In absence of a total tear, when the repetitive load exceeds the healing capacity of the tenocyte (overuse), the tendinopathy occurs.[10]

Overuse may cause damage at both the micro and the macrovasculature[11]. Impaired metabolic activity including disturbed oxygen transport is likely to be detrimental to molecular cross-linking and tissue repair. The ageing tendon is characterized by a low rate of metabolism, a progressive decrease in elasticity and tensile strength and a decreasing tendon blood flow; thus, age would be regarded as an important predisposing factor in the occurrence of tendinopathy [12].

In most cases, the tendon involved shows no signs of inflammation but instead shows fibroblasts, vascular hyperplasia, hyper cellularity, and disorganized collagen [13]. The rotator cuff consistently show both weakness and muscular imbalance of the external and internal rotator muscles on the injured extremity in patients with rotator cuff impingement and glenohumeral joint instability[14].

Chronic pain or repeated tendinopathies could result from the absence of consensus in treatment. Indeed, if the cause of tendinopathy is the inability of the tendon to bear constraints, passive treatments, generally purely analgesic and anti-inflammatory, could remain ineffective.



Research has demonstrated moderate evidence for exercise in the treatment of rotator cuff (RC) tendinopathy. This evidence has primarily addressed traditional concentric-eccentric resistance training with a lack of rationale for selection of contraction type, dosage, or progression of resistance. Recent literature has suggested that patients with tendinopathies respond well to eccentric training[15].

Eccentric strength training, first introduced in 1984 by Stanish et al., have been used successfully to treat tendinopathies for many years[1]. Eccentric training has been proposed as an effective conservative treatment for the Achilles and patellar tendinopathies[8]. Histological changes in the supraspinatus tendon have been found to have similarities with those of the Achilles and patellar tendons[1].

Three basic principles in an eccentric loading regime have been proposed[16].

(1) Length of tendon: the tendon length increases when the tendon is pre-stretched, and less strain will happen on that tendon during movement

(2) Load: the strength of the tendon should increase by progressively increasing the load exerted on the tendon

(3) Speed: by increasing the speed of contraction, a greater force will be developed.

It has been suggested that eccentric exercises expose the tendon to a greater load than concentric exercises[17]. So, the prescription of an eccentric exercise program could be the best mechanism for strengthening the tendon[18].

First bout of eccentric training could result in damage, including muscle pain, inflammation, cellular and subcellular alterations, force loss, blood markers of muscle damage[19]. The damage of eccentric contractions is related to a "mechanical insult", because as muscle lengthens, the ability to generate tension increases and a higher load is distributed among the same number of fibers, resulting in a higher load per fiber ratio and, curiously, a lower muscle activity[20]

The use of open chain exercise, initially in the modified base position, which is characterized by the glenohumeral joint elevated 20–30° in the scapular plane position[21-22] and progressing to 90° abducted training, has been shown to increase multiple parameters of muscle function[23-24] and also to improve functional performance.

Closed kinetic chain exercises promote cocontraction of rotator cuff musculature which decreases glenohumeral translation at various levels of elevation. Early in the rehabilitation process, closed kinetic chain exercises promote safe, functional co-contractions and can functionally strengthen the rotator cuff[25].

1.1 NEED FOR THE STUDY

Eccentric training has been proposed as an effective conservative treatment for the Achilles and patellar tendinopathies, but less evidence exists about its effectiveness for the rotator cuff tendinopathy[8].Open chain and closed chain exercises seem to be effective in bringing about short term changes in pain and disability in patients with rotator cuff tendinopathy[3].

But there is lack of evidence on the effect of eccentric training combined with open chain exercise versus eccentric training combined with closed chain exercise in individual with the rotator cuff tendinopathy. So this study is sought to **"Compare the efficacy of open chain exercise versus closed chain exercise in reducing pain and improving the functional status in patients with rotator cuff tendinopathy".**

1.2 OBJECTIVE

1. To determine the effects of open chain exercise along with eccentric training in reducing pain and improving functional status in patients with rotator cuff tendinopathy.
2. To determine the effects of closed chain exercise along with eccentric training in reducing pain and improving functional status in patients with rotator cuff tendinopathy.
3. To compare the effectiveness of open chain exercise versus closed chain exercise in reducing pain and improving functional status in patients with rotator cuff tendinopathy .

1.3 HYPOTHESIS

Null hypothesis: There will be no significant difference in pain reduction and functional improvement in patients with rotator cuff tendinopathy between the groups.

Alternative hypothesis: There will be a significant difference in pain reduction and functional improvement in patients with rotator cuff tendinopathy between the groups.

1.4 OPERATIONAL DEFINITION:

Tendinopathy

Tendinopathy is a failed healing response of the tendon, with proliferation of tenocytes, intracellular abnormalities in tenocytes, disruption of collagen fiber, and a subsequent increase in the non-collagenous matrix. The term tendinopathy is a generic descriptor of the clinical condition including both pain and pathological characteristics associated with overuse in and around tendons.[26]

Eccentric training

The eccentric exercise is the contraction of a muscle for controlling or decelerating a load while the muscle and the tendon are stretching or remain stretched.[27] The tension in muscle fibers when lengthening is considerably greater than when muscle fibers are shortening it can help the healing of the tendon by changing its metabolism and their structural and mechanical properties[28].

Open kinetic chain exercise

An open kinetic chain is defined as "a combination of successively arranged joints in which the terminal segments can move freely".

Closed kinetic chain exercise

Closed Kinetic Chain (CKC) exercises or closed chain exercises are exercises or movements where the distal aspect of the extremity is fixed to an object that is stationary. With the distal part fixed, movement at any one joint in the kinetic chain requires motion as well at the other joints in the kinetic chain therefore, both proximal and distal parts receive resistance training at the same time.

1.5 PROJECTED OUTCOME

Relaying on the literature review, it is expected that both open chain exercise and closed chain exercise along with eccentric training will reduce pain and improve the functional status in patients with rotator cuff tendinopathy.

CHAPTER – II

REVIEW OF LITERATURE

- **Stuart R Heron et al (2016)** conducted a randomised cross-over trial Comparing three types of exercise in the treatment of 120 patients with rotator cuff tendinopathy/shoulder impingement syndrome. Shoulder Pain and Disability Index (SPADI) was used. The outcome was measured at baseline and six weeks after commencing treatment. They concluded that Open chain, closed chain and range of movement exercises all seem to be effective in bringing about short term changes in pain and disability in patients with rotator cuff tendinopathy.

- **Nikos V. Margaritelis et al (2015)** this study is to challenge the repeated bout effect always appears after few eccentric exercise sessions, by exploiting specificity in muscle plasticity. Seventeen young men were randomly assigned into one of the following groups: the alternating eccentric-concentric exercise group; and the eccentric-only exercise group. Both groups performed 8 weeks of resistance exercise using the knee extensors of both legs on an isokinetic dynamometer. The study concluded that muscle strength was elevated similarly for both alternating and eccentric-only exercise groups after 13 weeks of training. The alternating eccentric-concentric exercise scheme, implemented in the present study, has for the first time successfully overcame the repeated bout effect. The similarity in muscle strength measurements following the two protocols is against the notion that inflammation plays an important role in exercise-induced adaptations in muscle.

- **Christiana lynneblume (2014)** conducted a study to compare the effectiveness of an eccentric progressive resistance exercise (PRE) intervention to a concentric PRE intervention in adults with SAIS, to determine if five or eight weeks of intervention was adequate to achieve significant changes in the shoulder outcome measures and to examine the correlations between the DASH and the physical measures of shoulder AROM and strength. The findings of this study indicate that supervised PRE both concentric and eccentric exercise for scapular and rotator cuff muscles performed twice a week for eight weeks may be beneficial in restoring function in patients with SAIS.

- **Paula R Camargo, Francisco Alburquerque-Sendín et al (2014)** conducted asystemic review on "Eccentric training as a new approach for rotator cuff tendinopathy" concluded that the eccentric training should be used aiming improvement of the tendon degeneration, and usual stretching and strengthening exercises associated with manual therapy techniques should be used to restore kinematics and muscle activity.

- **Adilson J. Meneghel (2013)** the present review addresses the issue by bringing up to date information about the protective effect to physical exercise when performed by untrained and trained populations. The data indicate that there is a reduction in the magnitude of indirect markers of muscle damage when the trained population conducts repeated exercise sessions compared to untrained and/or sedentary individuals. Among the adaptive responses involved, the neural theory appears to be the main mechanism involved in mitigating the indirect markers of muscle damage.

- **Jeong-Il Kang, Young-Jun Moon et al** conducted the study to find the effect on activities, shoulder muscle fatigue, upper limb disability of two exercise types performed by patients in the post- immobilization period of rotator cuff repair. The intervention program was performed by 20 patients from 6 weeks after rotator cuff repair. Ten subjects each were randomly allocated to a group performing open kinetic chain exercise and a group preforming closed kinetic chain exercise. Muscle activity and median frequency were measured by using sEMG and the Upper Extremity Function Assessment before and after conducting the intervention .The Median power frequencies of all these muscles after closed kinetic chain exercise increased indicating that muscle fatigue decreased. Therefore, research into exercise programs using closed kinetic chain exercises will be needed to establish exercise methods for reducing muscle fatigue.

- **Philip W McClure, Jason Bialker et al** the purpose of this study was to identify changes that might occur in 3-dimensional scapular kinematics, physical impairments, and functional limitations. Fifty-nine patients with impingement syndrome were recruited, and 39 patients successfully completed the 6-week rehabilitation program and follow-up testing. Pain, satisfaction, and function were measured using the University of Pennsylvania Shoulder Scale. Range of motion, isometric muscle force, and 3-dimensional scapular kinematic data

also were collected. Subjects were given a progressive exercise program that included resistive strengthening, stretching, and postural exercises that were done daily at home. The study concluded that the exercise protocol in the management of shoulder impingement syndrome may have a positive impact on patients' impairments and functional limitations.

- **F. Struyf, J. Nijs et al (2012)** conducted a study on scapular-focused treatment in patients with shoulder impingement syndrome: a randomized clinical trial. The purpose of this clinical trial is to compare the effectiveness of a scapular-focused treatment with a control therapy in patients with shoulder impingement syndrome. 22 patients with shoulder impingement syndrome were selected. The primary outcome measures included self-reported shoulder disability and pain. The scapular-focused treatment included stretching and scapular motor control training. The control therapy included stretching, muscle friction, and eccentric rotator cuff training. Main outcome measures were the shoulder disability questionnaire, diagnostic tests for shoulder impingement syndrome, clinical tests for scapular positioning, shoulder pain (visual analog scale; VAS), and muscle strength.

- **John McMullen, Timothy L. Uhl, et al** introduced an approach to rehabilitate shoulder under the topic "A Kinetic Chain Approach for Shoulder Rehabilitation" that integrates the kinetic chain throughout the rehabilitation. They narrated that the exercises in this approach are consistent with biomechanical models, apply biomechanical and motor control theory, and work toward sport specificity. The exercises are designed to stimulate weakened tissue by motion and force production in the adjacent kinetic link segments. The paradigm of kinetic chain shoulder rehabilitation suggests that functional movement patterns and closed kinetic chain exercises should be incorporated throughout the rehabilitation process.

- **Salvador Israel Macías-Hernández and Luis Enrique Pérez-Ramírez** conducted a study to present the overview of the efficacy of eccentric training in tendinopathies and current evidence of its benefit in rotator cuff tear. Four studies published on eccentric strengthening for rotator cuff tears were analyzed. There is theoretical evidence about its usefulness in this pathology, but only a controlled clinical trial has been published with data on improvement in strength but not in pain or functionality. They concluded that more studies are needed with

better methodological designs in order to generate evidence of their utility and recommendation.

- **Paula R. Camargo et al (2012)** conducted a study to evaluate the effects of eccentric training for shoulder abductors on pain, function, and isokinetic performance during concentric and eccentric abduction of the shoulder in subjects with SIS. Twenty subjects with unilateral SIS were selected. Bilateral isokinetic eccentric training for shoulder abductors was performed for six consecutive weeks, twice a week, on alternate days. The Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire was used to evaluate functional status and symptoms of the upper limbs. This study suggests that isokinetic eccentric training for shoulder abductors improves physical function of the upper limbs in subjects with SIS.

- **Aaron Sciascia and Robin Cromwell (2012)** purpose of this paper is to present a theoretical framework which focuses on maximizing kinetic chain utilization and output, accomplished through improving flexibility of all involved joints and soft tissue, strengthening the lower extremity and core musculature, optimizing scapular control, and improving muscular endurance of persons experiencing shoulder pain. The study concluded that rehabilitation of the throwing athlete's shoulder should follow a kinetic chain-based regimen that addresses specific deficits within individual links which can aid in restoring the natural proximal to distal muscle activation sequencing.

- **Susanne Bernhardsson et al (2011)** conducted a study to evaluate the effect on pain intensity and function of an exercise concept focusing on specific eccentric strength of the rotator cuff which is a home-based training programme supervised and supported by visits to physiotherapy clinic in 10 patients with subacromial impingement syndrome. The outcome was measured using visual analogue scale, Patient-Specific Functional Scale and Western Ontario Rotator Cuff Index. They concluded that a 12-week eccentric strengthening programme targeting the rotator cuff and incorporating scapular control and correct movement pattern can be effective in decreasing pain and increasing function in patients with subacromial impingement syndrome.

- **Todd S Ellenbecker, Ann Cools (2010)** the purpose of this article is to present an evidence-based review of the key treatment strategies to rehabilitate and restore shoulder function of the athlete with rotator cuff impingement. The study concluded that the integration of key physical examination techniques with evidence-driven rehabilitation concepts to restore optimal ROM and rotator cuff and scapular strength and stabilization forms the basis of clinical rehabilitation of the athlete with rotator cuff impingement.

- **M Roiget al (2008)** this systematic review with meta analysis was conducted to determine if eccentric exercise is superior to concentric exercise in stimulating gains in muscle strength and mass. Twenty randomized controlled trial studies met the inclusion criteria. Meta-analyses showed that when eccentric exercise was performed at higher intensities compared with concentric training, total strength and eccentric strength increased more significantly. The study concluded that Eccentric training performed at high intensities was shown to be more effective in promoting increases in muscle mass measured as muscle girth.

- **Anne M. Boonstra, et al (2008)** conducted a study to determine the reliability and concurrent validity of a visual analogue scale (VAS) for disability as a single-item instrument measuring disability in chronic pain patients was the objective of the study. Concluded that reliability of the VAS for disability in patients with chronic musculoskeletal pain is good.

- **Andre´aDiniz Lopes, et al (2008)** this study is to evaluate the validity and reliability of the Brazilian Portuguese version of the Western Ontario Rotator Cuff Index. Concluded that Brazilian version of the WORC proved to be a valid and reliable measurement tool for assessing health-related quality of life in patients with rotator cuff diseases.

CHAPTER III

MATERIALS AND METHODS

3.1 MATERIALS:

1. Theraband
2. Weight cuffs
3. Ball
4. Mat
5. Armed chair
6. WORC questionnaire
7. Pamphlets

3.2 STUDY DESIGN:

Randomized clinical trial study design.

The subjects are randomly allocated into 2 groups (Group A and Group B) by Computer generated random numbers.

The assessment was taken for all the participants before training session and after the end of fourth week for statistical analysis and pretest values of both groups were compared with posttest values in selected parameters over a period of time.

3.3 STUDY SETTING:

The study was conducted in the Department of Orthopedics& Department of Physical Medicine and Rehabilitation, PSG hospitals, Coimbatore.

3.4 HUMAN PARTICIPATION PROTECTION:

The study was reviewed and approved by institutional human ethics committee at PSG IMSR.

3.5 POPULATION/PARTICIPANTS:

30 individuals with rotator cuff tendinopathy, age group ranging from 30-60 years were participated. Based on the selection criteria 15 individuals were randomly assigned into each groups using computer generated randomization method.

Group A: open chain exercise with eccentric training

Group B: closed chain exercise with eccentric training

The above 2 groups will receive warm up, eccentric training and cool down exercise.

3.6 SAMPLING:

Computer based randomized sampling method

3.7 CRITERIA FOR SAMPLE SELECTION

3.7.1 Inclusion criteria:

- Age: 30-60years
- Shoulder pain for at least 3 months.
- 3 positive out of 5 following diagnostic test
    - Neers impingement test
    - Hawkin kennedy impingement test
    - Jobes suprespinatus test
    - Painful arc between 60-120° during active abduction.
    - Tenderness on palpation over supraspinatus or infraspinatus insertion.

3.7.2 Exclusion Criteria:

- Complete tendon rupture
- Substantial radiating neck pain
- Chronic rheumatic or inflammatory disease
- Previous surgery of the affected shoulder
- Instability of the shoulder
- Osteoarthritis in the acromio-clavicular joint
- Adhesive capsulitis
- Subacromial corticosteroid injection within the past three months

3.8 STUDY DURATION:-

Total duration of 8 months was adopted for this study.

3.9 TREATMENT DURATION:-

- 3days /week for 4 week
- 2 sessions per day
- 45 minutes per session

3.10 INTERVENTION

Based on **Stuart R. heron et al** the protocol consists of 3 phases of exercise for both the groups. The 3 phases of exercise include: a warm-up phase, a work phase and a cool down phase with relaxation activities. The sessions last approximately 45 min, and the loads are adapted to the possibilities of the subjects to avoid fatigue. A total of 12 sessions are prescribed, on alternate days, 3 times a week for four weeks[3]. The distributions of the intervention in the groups and the weekly progression are shown in the Tables below.

The emphasis and relative success of these exercise programmes for the rotator cuff tendinopathy has been outlined in "Rehabilitation of shoulder impingement syndrome and rotator cuff injuries: an evidence-based review by **Todd S Ellenbecker et al.** The weekly progression of the exercise for both the group was made based on this[29].

Exercise protocol

Treatment duration -45 minutes

GROUP-A	GROUP-B
10 MINUTES-WARM UP EXERCISE • Shoulder shrugs • Shoulder bracing • Shoulder circles • Trapezius stretching • Pectoralis stretching	**10 MINUTES WARM UP EXERCISE** • Shoulder shrugs • Shoulder bracing • Shoulder circles • Trapezius stretching • Pectoralis stretching
20 MINUTES OPEN CHAIN EXERCISE • Shoulder abduction using theraband • Shoulder external rotation using theraband	**20 MINUTES CLOSED CHAIN EXERCISE** • Wall press up • Press up in 4 point kneeling • Press up in sitting
10 MINUTES ECCENTRIC TRAINING • Shoulder abduction using weights • Shoulder external rotation using weights • Rolling ball on the wall	**10 MINUTES ECCENTRIC TRAINING** • Shoulder abduction using weights • Shoulder external rotation using weights • Rolling ball on the wall
5 MINUTES OF COOL DOWN PERIOD • Shoulder shrugs • Shoulder bracing exercise • Shoulder circles	**5 MINUTES OF COOL DOWN PERIOD** • Shoulder shrugs • Shoulder bracing exercise • Shoulder circles

Weekly progression of exercises

	WEEK-1	WEEK-2	WEEK-3	WEEK-4
OPEN CHAIN EXERCISE	Degree of motion- 0^o to 30-45^o	Degree of motion- 0^o to 30-45^o	Degree of motion- 0^o to full available range	Degree of motion- 0^o to full available range
	1 set of 10 repetition	1 set of 15 repetition	2 set of 10 repetition	2 set of 15 repetition
	2 sessions per day	2 sessions per day	2 sessions per day	2 sessions per day
CLOSED CHAIN EXERCISE	Using both the hands during exercise	Using both the hands during exercise	Using only the affected hands during exercise	Using only the affected hands during exercise
	1set of 10 repetition	1set of 15 repetition	2 set of 10 repetition	2 set of 15 repetition
	2 sessions per day	2 sessions per day	2 sessions per day	2 sessions per day

3.11 INSTRUMENT& TOOL FOR DATA COLLECTION:

- Visual analogue scale[VAS]
- Western Ontario rotator cuff index[WORC]

3.12 TECHNIQUE OF DATA COLLECTION:

Initial assessment was taken on the first day of intervention by using outcome measures. After obtaining the informed consent form, the Intervention was given to each group separately for 4 weeks. Final assessment was taken after the 4 weeks of exercise therapy treatment using same outcome measures. Comparison of pretest and posttest values within the group and between the groups was done finally.

3.13 TECHNIQUE OF DATA ANALYSIS &INTERPRETATION:

Data collected from subjects were analyzed using paired‘t’ test to measure changes between pretest and posttest values of outcome measures within the group. Independent‘t’ test was used to measure the changes between the groups.

Paired ‘t’ test

$$SD = \sqrt{\frac{\sum (d - \overline{d})^2}{n-1}}$$

$$t = \frac{\overline{d}\sqrt{n}}{SD}$$

$\overline{d}$ = Calculated Mean Difference of pretest and posttest values

SD = Standard Deviation

n = Number of samples

d = Difference between pretest and posttest values

Independent 't' test

$$t = \frac{|\bar{x}_1 - \bar{x}_2|}{SD\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

Where,

$$SD = \sqrt{\frac{(n_1 - 1)SD_1^2 + (n_2 - 1)SD_2^2}{(n_1 + n_2) - 2}}$$

$\overline{X_1}$ = Mean difference in Group A

$\overline{X_2}$ = Mean difference in Group B

SD = Combined standard deviation of Group A and Group B

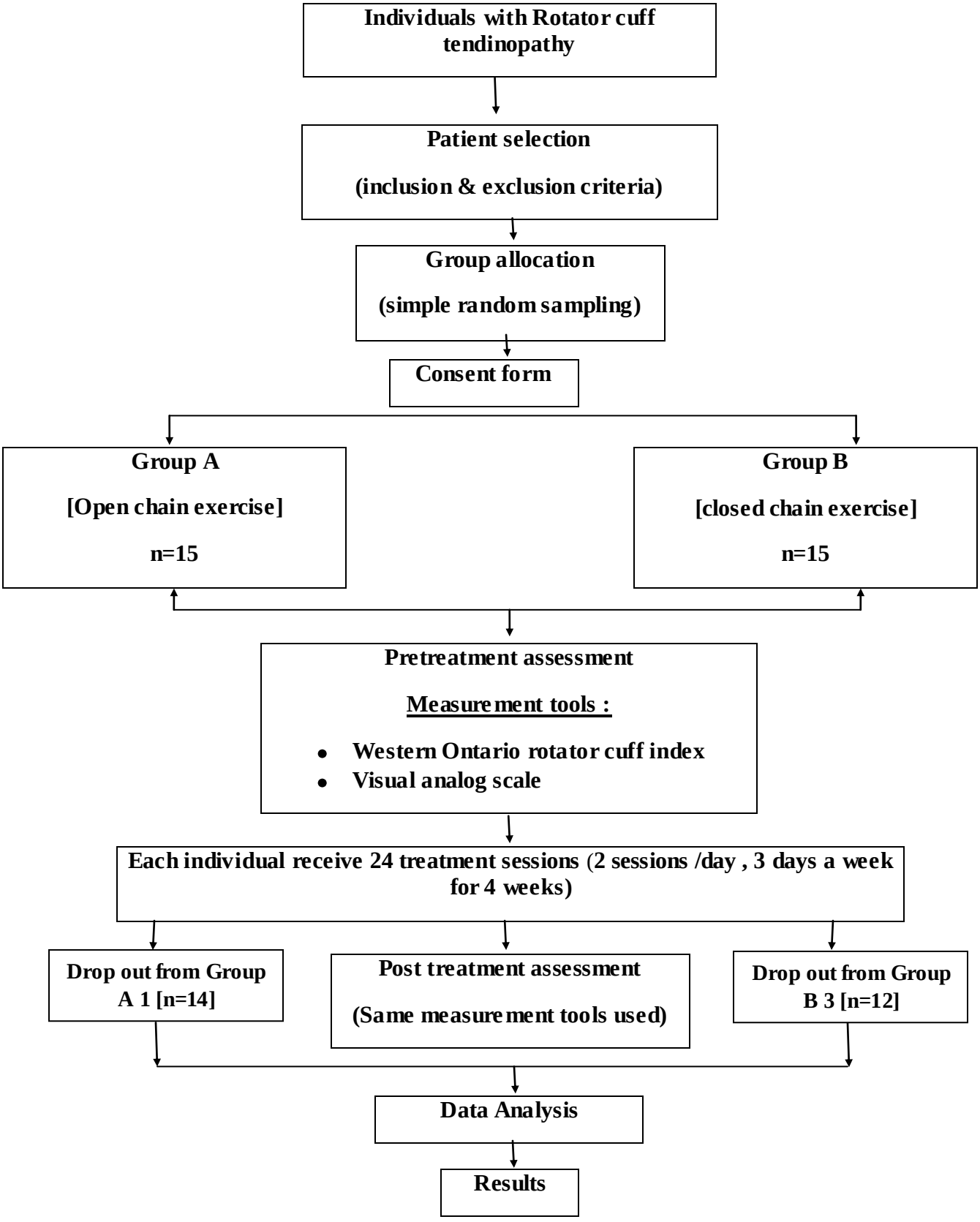
n_1 = Number of patients in Group A

n_2 = Number of patients in Group B

SD_1 = Standard Deviation of Group A

SD_2 = Standard Deviation of Group B

SCHEMATIC REPRESENTATION OF FLOW OF PARTICIPANTS



CHAPTER - IV

STATISTICAL ANALYSIS AND INTERPRETATION

Data analysis is the systemic organization and synthesis of research data and testing of research hypothesis using these data. Interpretation is the process of making sense of the results of a study and examining the implication (Polit & Belt, 2004). The pretest and posttest values for Groups A& B were obtained before and after intervention. The pain reduction and improvement in functional status was measured using Visual analogue scale [VAS]**,** Western Ontario rotator cuff index. The mean, standard deviation and Paired "t" test values were used to find out whether there was any significant difference between pretest and posttest values within the groups.

Independent "t" test is used to find the significant differences between the groups after intervention.

TABLE: 1

Pre and Post test values of visual analogue scale in Group A (n=14)

S No.	Pre test	Post test
1.	65	51
2.	51	42
3.	70	40
4.	75	65
5.	82	60
6.	84	61
7.	91	65
8.	90	40
9.	73	51
10.	61	60
11.	75	65
12.	61	30
13.	62	35
14.	65	44

Graph: 1

Pre and Post test values of visual analogue scale in Group A (n=14)

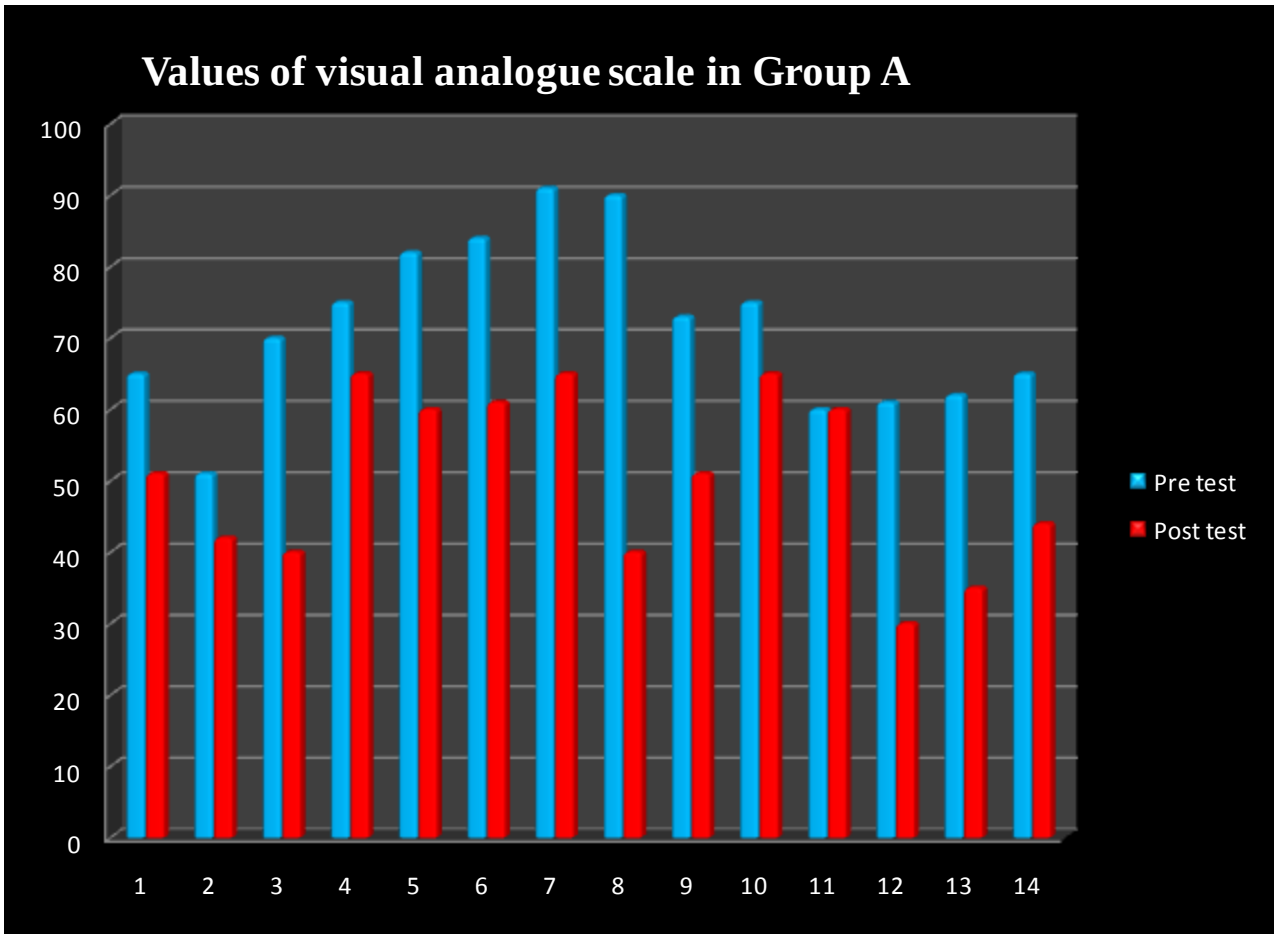


Table: 2

PRE AND POST TEST VALUES OF VISUAL ANALOGUE SCALE IN GROUP B (N=12)

S No.	Pre test	Post test
1.	80	52
2.	70	43
3.	77	30
4.	75	60
5.	76	55
6.	85	52
7.	60	43
8.	85	65
9.	45	20
10.	71	21
11.	55	25
12.	60	44

Graph: 2

PRE AND POST TEST VALUES OF VISUAL ANALOGUE SCALE IN GROUP B (N=12)

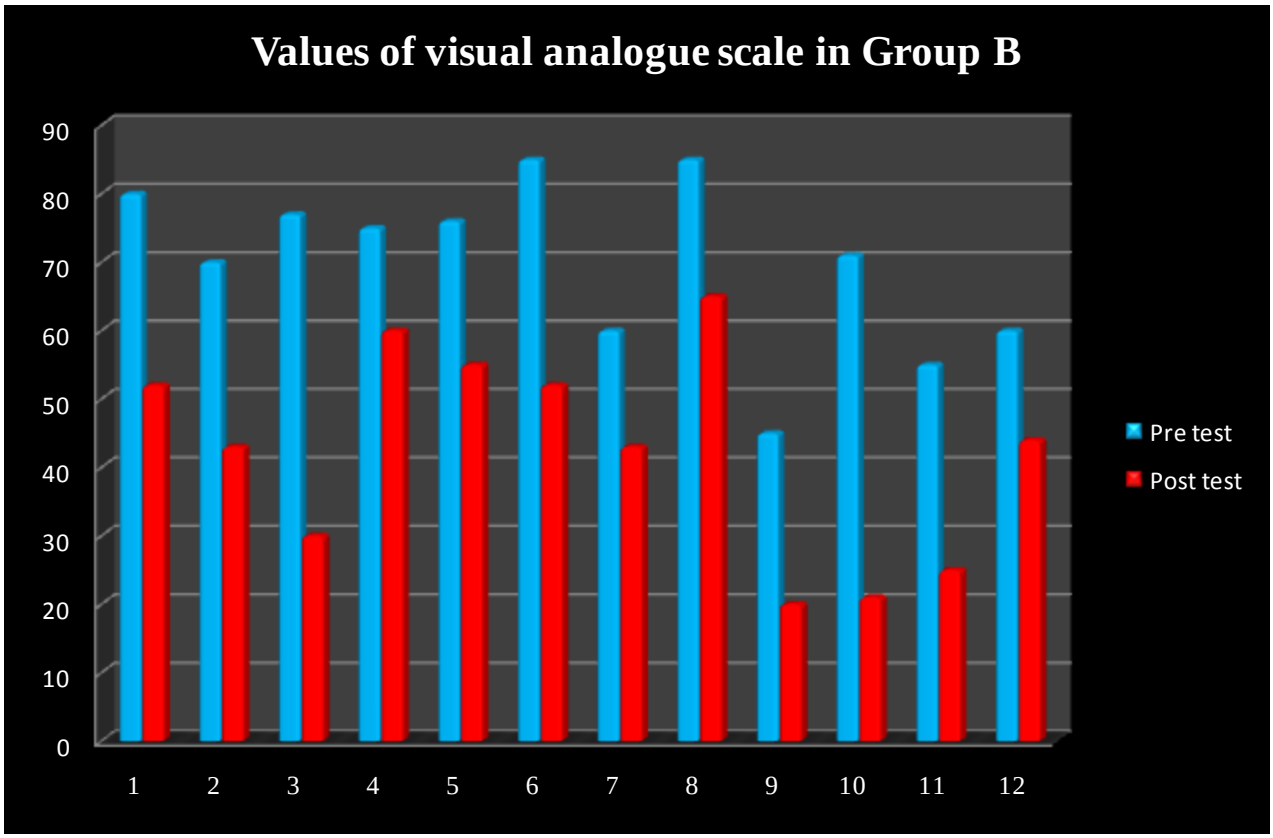


Table: 3

MEAN, MEAN DIFFERENCE, STANDARD DEVIATION AND PAIRED 't' TEST VALUES OF VISUAL ANALOGUE SCALE OF GROUPS A AND GROUP B

Groups (VAS)	Mean	Mean Difference	Standard Deviation	't' Value	'p' Value
Group A Pre-test	71.79	21.14	12.16	6.50	p<0.01
Group A Post-test	50.64				
Group B Pre-test	69.92	27.42	11.39	8.34	p<0.01
Group B Post-test	42.50				

Based on Table 3, the mean difference of group A was found to be 21.14, Standard deviation was 12.16, the 't' value using the paired 't' test was 6.50 which was greater than the table value of 3.012 at p<0.01. In Group B the mean difference was 27.42, standard deviation was 11.39, the 't'value using the paired test was 8.34 which was greater than the table value of 3.012 at p<0.01. This shows there is a significant reduction in pain for VAS in both groups. The result shows that pretest and posttest mean difference of VAS of group A and group B have statistically no significant difference.

GRAPH: 3

MEAN, MEAN DIFFERENCE, STANDARD DEVIATION AND PAIRED 't' TEST VALUES OF VISUAL ANALOGUE SCALE OF GROUPS A AND GROUP B

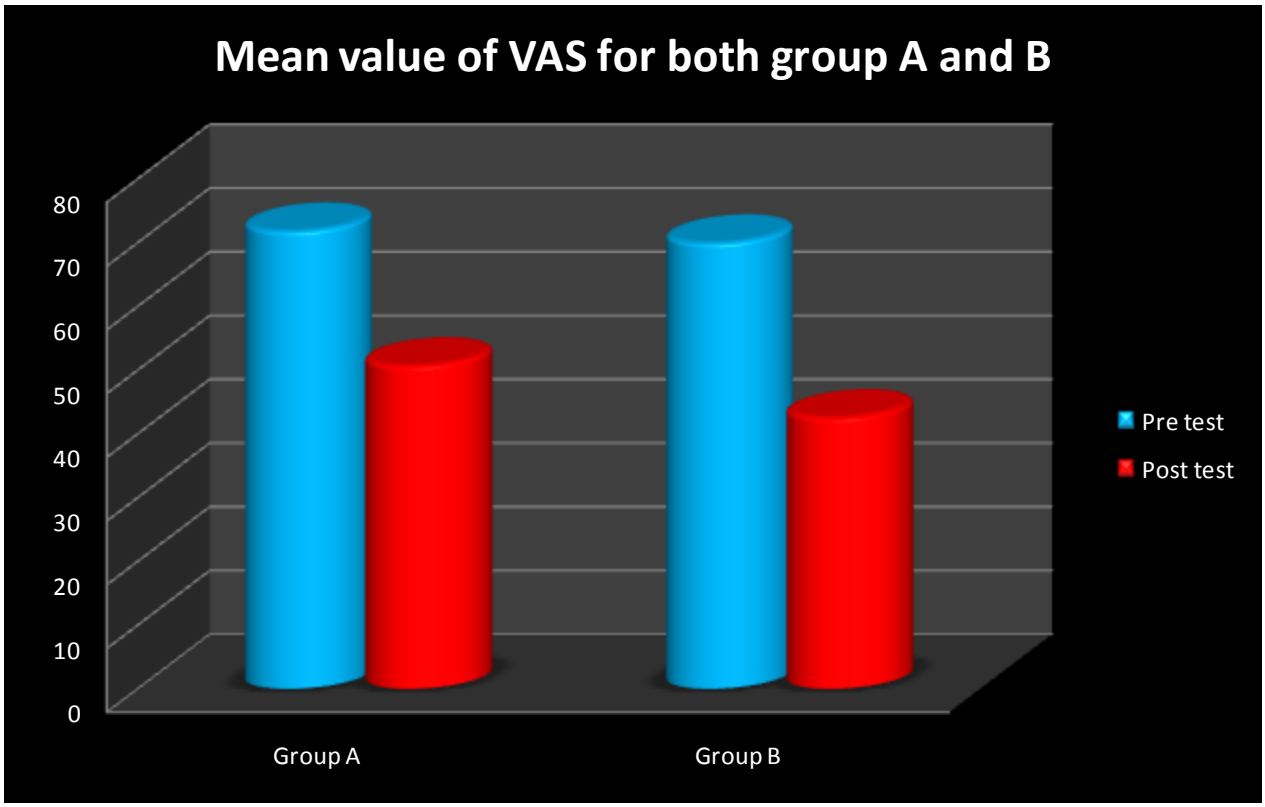


TABLE: 4

PRE AND POST TEST VALUES OF WESTERN ONTARIO ROTATOR CUFF INDEX IN GROUP A (n=14)

S No.	Pre test	Post test
1	46.6	56.1
2	53.3	75.4
3	30	50.7
4	42.6	50.2
5	26.4	46.9
6	35	55
7	14.2	46.4
8	23.3	61.4
9	35.9	54.4
10	39.5	44.5
11	30.7	45.9
12	50.9	75
13	46.6	65.4
14	46.1	70.9

GRAPH: 4

PRE AND POST TEST VALUES OF WESTERN ONTARIO ROTATOR CUFF INDEX IN GROUP A (N=14)

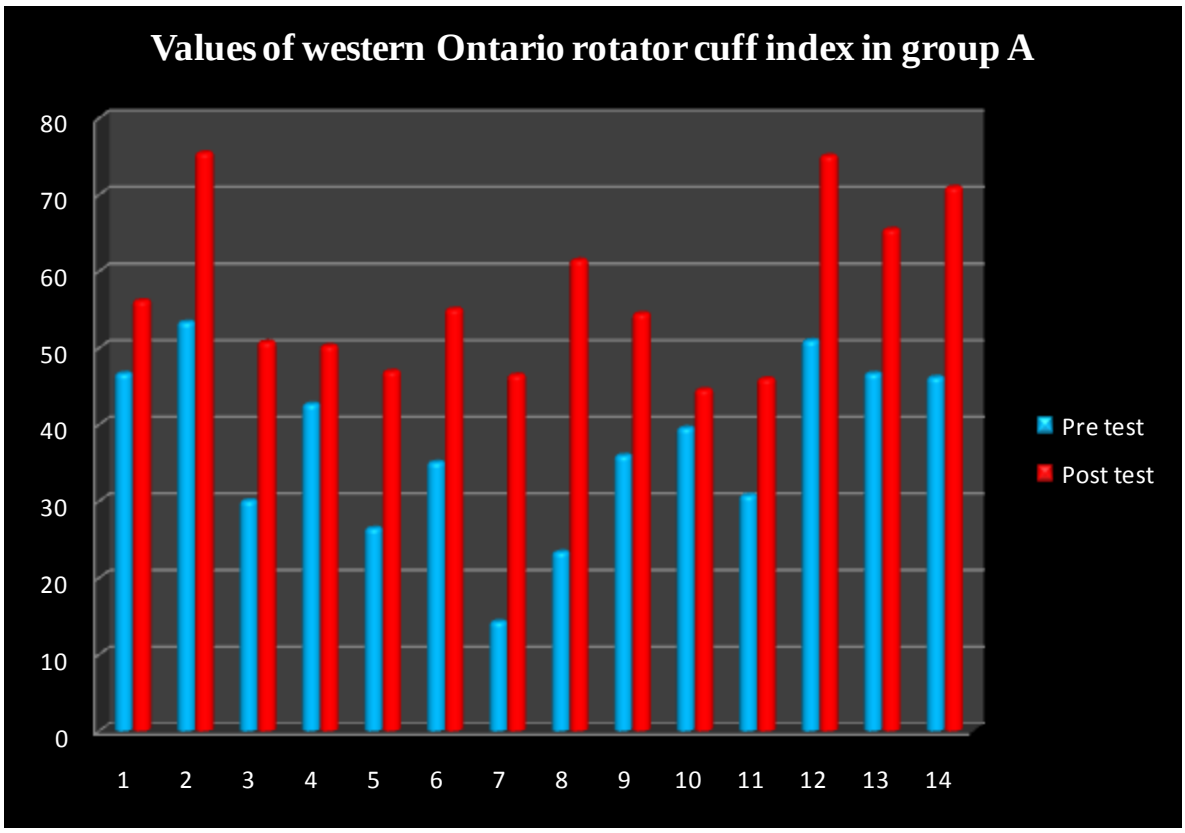


TABLE: 5

PRE AND POST TEST VALUES OF WESTERN ONTARIO ROTATOR CUFF INDEX IN GROUP B (N=12)

S No.	Pre test	Post test
1.	44.5	65.9
2.	41.9	64.5
3.	64.75	92.8
4.	29.5	49.2
5.	31.6	47.6
6.	24.2	46.6
7.	50.4	69.5
8.	19.2	41.1
9.	65.2	86.4
10.	40.9	84.5
11.	40.4	61.4
12.	52.1	72.1

GRAPH: 5

PRE AND POST TEST VALUES OF WESTERN ONTARIO ROTATOR CUFF INDEX IN GROUP B (n=12)

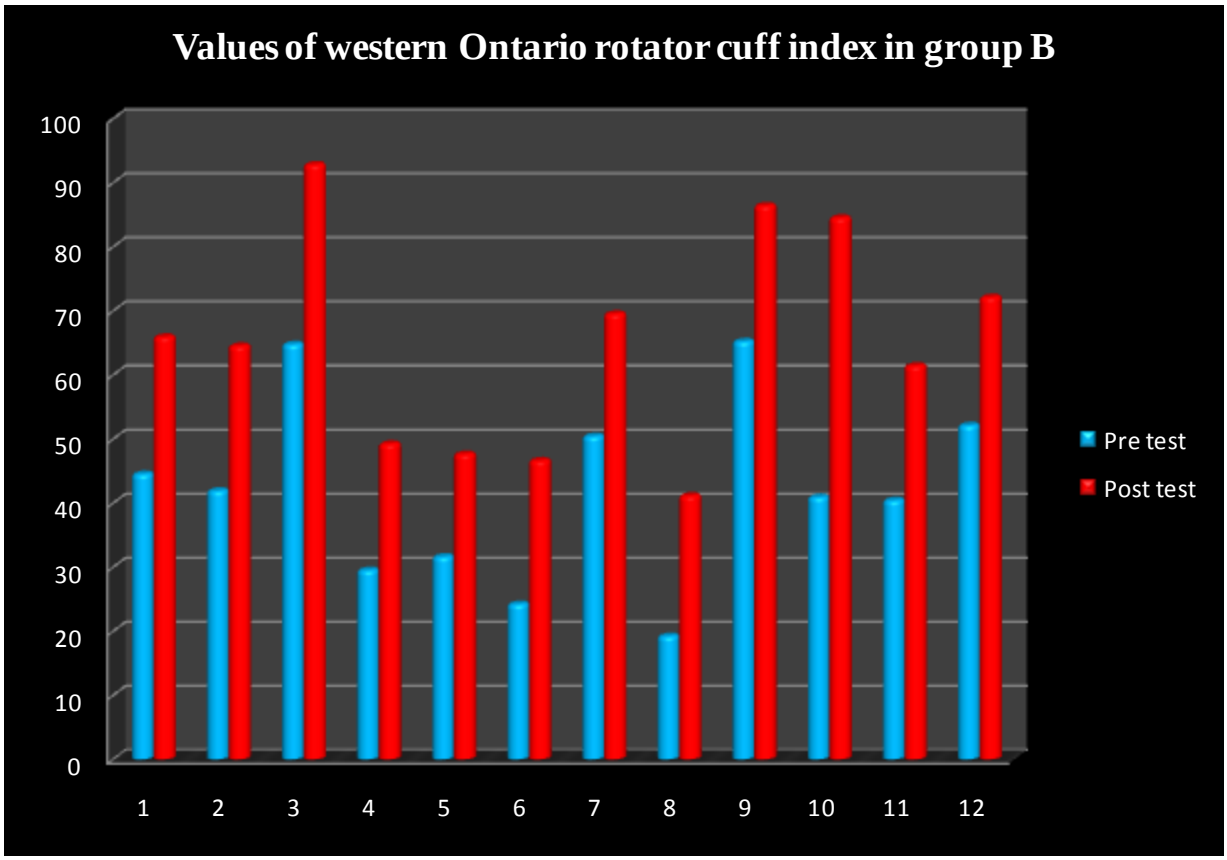


TABLE: 6

MEAN, MEAN DIFFERENCE, STANDARD DEVIATION AND PAIRED 't' TEST VALUES OF WORC OF GROUPS A AND GROUP B

Groups (WORC)	Mean	Mean Difference	Standard Deviation	't' Value	'p' Value
Group A Pre-test	37.26	20.46	8.98	8.53	p<0.01
Post-test	57.73				
Group B Pre-test	42.05	34.10	10.08	11.72	p<0.01
Post-test	76.15				

Based on Table 6, the mean difference of group A was found to be 20.46, Standard deviation was 8.98, the 't' value using the paired 't' test was 8.53 which was greater than the table value of 3.106 at $p<0.01$. In Group B the mean difference was 34.10, standard deviation was 10.08, the 't'value using the paired test was 11.72 which was greater than the table value of 3.106 at $p<0.01$. This shows there is a significant improvement in WORC in both groups. The result shows that pretest and posttest mean difference of WORC of group B is statistically significant than Group A

GRAPH: 6

MEAN, MEAN DIFFERENCE, STANDARD DEVIATION AND PAIRED 't' TEST VALUES OF WORC OF GROUPS A AND GROUP B

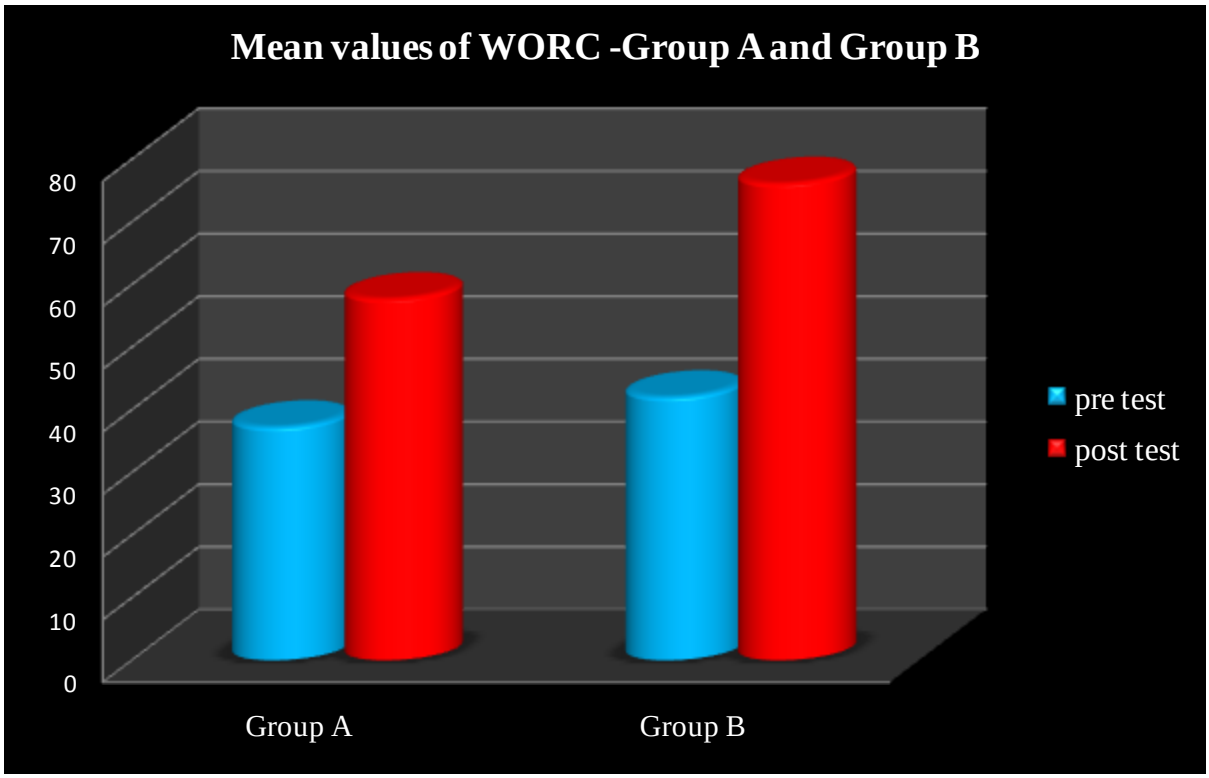


TABLE: 7

COMPARISON BETWEEN THE GROUP A AND GROUP B

Outcome Measures	Mean Difference	Standard Deviation	"t" value	"p" value
VAS	8.14	12.14	1.51	NS*
WORC	17.59	12.60	3.84	P<0.01

*NS= Non Significant

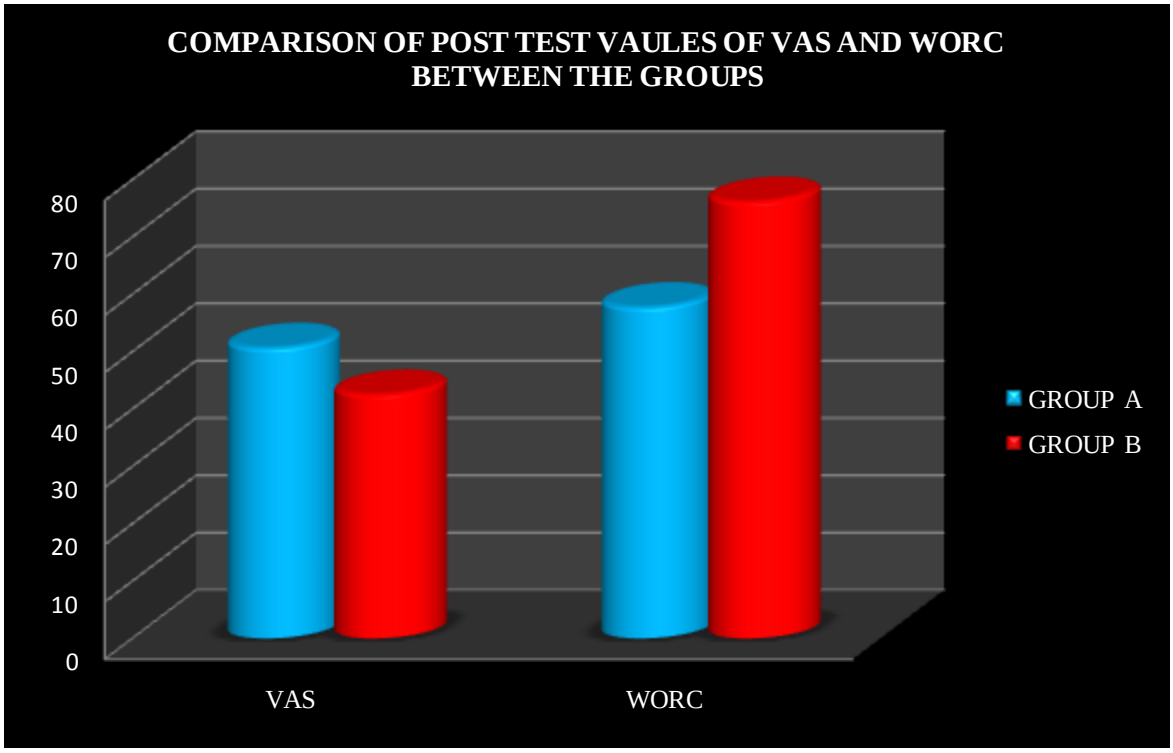
The Independent 't' test was performed between Group A and Group B to analyze the significance between the open chain exercise with eccentric training and closed chain exercise with eccentric training on pain reduction and functional improvement in patients with rotator cuff tendinopathy.

The visual analog scale (VAS) between the groups were calculated using independent 't' test & the 't' value was 1.51 which was lesser than the table value of 2.779 at p>0.01.
The western Ontario rotator cuff index (WORC) between the group were calculated using independent 't' test & the obtained 't' value is 3.84 which was greater than that of table value of 2.779 at p<0.01.

Therefore the results of these statistical analyses showed that the Group B is effective on improving the functional status compared to Group B. And there is no significant difference in both groups on pain.

GRAPH: 7

COMPARISON BETWEEN THE GROUP A AND GROUP B



CHAPTER V

RESULTS AND DISCUSSION

The aim of this study was to compare the efficacy of open chain exercise versus closed chain exercise in reducing pain and improving the functional status in patients with rotator cuff tendinopathy.

A total of 30 patients diagnosed with rotator cuff tendinopathy in the age group of 30-60 years participated in this study. The participants who satisfied the selection criteria were randomly assigned into two groups. Baseline measurements were taken using the visual analogue score (VAS) and Western Ontario rotator cuff index (WORC) for both groups. One group received open chain exercise combined with eccentric training and the other group received closed chain exercise combined with eccentric training for4 weeks. At the end of 4 weeks, participants were again evaluated and measurements were taken using same outcome measures. Statistical analysis for the present study was done using SPSS (version 16).

No two individual with rotator cuff tendinopathy have similar impairment and thus same functional limitation. Both males and females are affected equally. Dropout rate was higher in closed chain exercise group than the open chain exercise group.

The drop-out rate was higher than anticipated; three participants from closed chain exercise dropped the intervention program. The greater drop-out rate in the CC group may be due to patient's lack of knowledge and importance about the exercise protocol. Three participants dis-engaged from closed chain exercise treatment protocol totally. One participant dropped out choosing the surgical repair to correct rotator cuff tear following a fall on outstretched hand.

One participant from open chain exercise group failed to complete the intervention and did not provide follow up data. It is plausible that a key component in successful rehabilitation of RC tendinopathy in open chain exercise group is patient compliance.

Participants were selected cautiously not to generalize these results to younger or older patients. All participants in this study were between 30 and 60 years old a typical age group for the condition. In older patients, degenerative changes in the rotator cuff tendons are a contributory

factor. In younger patients, impingement is often secondary to instability, requiring different treatment

The WORC index score item related to Physical Symptoms, Sports/Recreation, Work and Lifestyle were the major issue for the patient and this was addressed and found significant improvement after the treatment. It takes four minutes to complete and is one of the easiest and quickest tools available to assess function and an excellent way to monitor individual patient progress. The Patient-Specific Functional Scale was selected in order to measure relevant and meaningful activities for each patient and because it is sensitive to individual change over time.

Tendon injuries are known to require a long healing time, and our results suggest that complete resolution of symptoms may not be expected within 4 weeks of eccentric training combined with open and closed chain exercise. The anatomical and functional complexity of the shoulder joint may require a more diversified rehabilitation program involving other muscles, and/or a longer treatment period.

Moncrief et al[30] have demonstrated the efficacy of these exercises in a 4-week training paradigm, and measured 8–10% increases in isokinetically measured internal and external rotation strength in healthy subjects.

The data from group A and B for VAS were analyzed using paired‘t’ test and independent‘t’ test. The calculated value of paired ’t‘ test for group A is 6.50 and for group B is 8.34 which is greater than the table value indicating there is a significant difference within both the group. The value of independent t test for both groups are 1.51 which is less than the table value indicating there is no significant difference between the groups. Hence the null hypothesis is accepted, alternate hypothesis is neglected**.**

The data from group A and B for WORC were analyzed using paired’t’ test and independent ‘t’ test. The calculated value of paired’t‘test for group A is 8.53 and for group B is 11.72 which is greater than the table value indicating there is a significant difference within both the group. The value of independent ‘t’ test for both groups are 3.84 which is greater than the table value indicating there is significant difference between the groups. Hence the alternate hypothesis is accepted, null hypothesis is neglected.

The principal finding of the present study was that both Group A and group B was significantly effective in reducing pain and improving functional status. Group B was more effective compared to Group A in improving functional status. And both groups show no more difference in pain.

Repeated activation of the RC following the exercise protocol may have reduced peripheral and central neurological sensitivity, this resulted in reductions in biochemical driven nociception. The mechanical loading stimulates the healing response of the tendon as it accelerates tenocytes metabolism and may speed repair. Gradual exposure to increasing use of the shoulder may have reduced psychological risk factors; it is also possible that changes in psychosocial factors may have contributed to the improvements observed in pain and functional status.

Eccentric training is a "tendon-strengthening" program. Eccentric exercises expose the tendon to a greater load than concentric exercises[31]thus strengthening the tendon[32]. High frequency oscillations are produced by eccentric contractions in the tendon and these fluctuations in force provide an important stimulus for the remodeling of the tendon these are the reasons behind the pain reduction and functional improvement.

Patients who completed the training program improved to the extent that they did not need surgery.

5.1 LIMITATIONS OF THE STUDY:

- All participants in this study were between 30 and 60 years.
- The study measures only pain and functional status.
- No blinding was done.
- There was a lack of long term follow up of patients to find out the carry over effects of the intervention

5.2 SUGGESTIONS FOR FUTURE RESEARCH:

- In future studies long term follow-up can be done to determine the effect of intervention.
- The study can also emphasize that scapular control and relearning program to correct movement pattern in the early phase of rehabilitation in future studies.

- The study can be conducted with control group to rule out that the natural maturation of the syndrome which would influence the results.
- Further research is needed in the clinical setting to avoid the some patients dis-engaging from treatment.
- The Further studies can be done in large samples because if more the sample size used, greater would be the significance.
- The study can be conducted with bilateral rotator cuff tendinopathy individuals.
- The future studies can be added with other outcome measures to assess the strength, Pain and other functional status in rotator cuff tendinopathic individuals.

CHAPTER VI

SUMMARY AND CONCLUSION

This study was conducted to compare the efficacy of open chain exercise versus closed chain exercise in reducing pain and improving the functional status in patients with rotator cuff tendinopathy.

Thus the statistical analysis of data concluded that **"Closed chain exercise group shows statistically significant improvement on functional status compared to Open chain exercise group, whereas there was statistically no significant difference in both Closed chain exercise and Open chain exercise group on pain"**

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ANNEXURE I

PSG Institute of Medical Sciences & Research
Institutional Human Ethics Committee
Recognized by The Strategic Initiative for Developing Capacity in Ethical Review (SIDCER)
POST BOX NO. 1674, PEELAMEDU, COIMBATORE 641 004, TAMIL NADU, INDIA
Phone : 91 422 - 2598822, 2570170, Fax : 91 422 - 2594400, Email : ihec@psgimsr.ac.in

To
Ms Ajitha C T
I Year MPT
Guide/s: Prof. R Mahesh / Mr B Nagaraj
PSG College of Physiotherapy
Coimbatore

Ref: Project No.17/114

Date: July 10, 2017

Dear Ms Ajitha,

Institutional Human Ethics Committee, PSG IMS&R reviewed and discussed your application dated 29.03.2017 to conduct the research study entitled "*Comparing the efficacy of open chain exercise versus closed chain exercise in reducing pain and improving the functional status in patients with rotator cuff tendinopathy*" during the IHEC review meeting held on 21.04.2017.

The following documents were reviewed and approved:

1. Project Submission form
2. Study protocol (Version 1 dated 29.03.2017)
3. Informed consent forms (Version 2 dated 04.07.2017)
4. Data collection tool (Version 2 dated 04.07.2017)
5. Permission letter from concerned Head of Department
6. Current CVs of Principal investigator, Co-investigators
7. Budget

The following members of the Institutional Human Ethics Committee (IHEC) were present at the meeting held on 21.04.2017 at College Council Room, PSG IMS & R between 2.30 pm and 4.30 pm:

Sl. No.	Name of the Member of IHEC	Qualification	Area of Expertise	Gender	Affiliation to the Institution Yes/No	Present at the meeting Yes/No
1	Mrs Y Ashraf	MPT	Physiotherapy	Female	Yes	Yes
2	Dr. S. Bhuvaneshwari (Member-Secretary, IHEC)	MD	Clinical Pharmacology	Female	Yes	Yes
3	Mr Gowpathy Velappan	BA., BL	Legal Advisor	Male	No	Yes
4	Dr A Jayavardhana	MD	Clinician (Paediatrics)	Male	Yes	Yes
5	Mr P Karuppuchamy	M Phil in PSW	Social Scientist	Male	Yes	Yes
6	Dr G Malarvizhi	M Sc, Ph D	Nursing	Female	Yes	No

7	Mr. R. Nandakumar (Chairperson, IHEC)	BA., BL	Legal Expert	Male	No	Yes
8	Dr. Parag K Shah	DNB	Clinician (Ophthalmology)	Male	No	Yes
9	Mrs P Rama	M Pharm	Non-Medical (Pharmacy)	Female	Yes	No
10	Dr. Seetha Panicker	MD	Clinician (Obstetrics & Gynaecology)	Female	Yes	No
11	Dr. S. Shanthakumari	MD	Pathology, Ethicist	Female	Yes	Yes
12	Dr. Sudha Ramalingam (Alternate Member-Secretary, IHEC)	MD	Public Health, Epidemiology, Genetics, Ethicist	Female	Yes	Yes
13	Mrs. Swasthika Soundararaj	MBA	Lay person	Female	No	Yes
14	Dr. D. Vijaya	M Sc, Ph D	Basic Medical Sciences (Biochemistry)	Female	Yes	No

The study is approved in its presented form. The decision was arrived at through consensus. Neither PI nor any of proposed study team members were present during the decision making of the IHEC. The IHEC functions in accordance with the ICH-GCP/ICMR/Schedule Y guidelines. The approval is valid until one year from the date of sanction. You may make a written request for renewal / extension of the validity, along with the submission of status report as decided by the IHEC.

Following points must be noted:

1. IHEC should be informed of the date of initiation of the study
2. Status report of the study should be submitted to the IHEC every 12 months
3. PI and other investigators should co-operate fully with IHEC, who will monitor the trial from time to time
4. At the time of PI's retirement/intention to leave the institute, study responsibility should be transferred to a colleague after obtaining clearance from HOD, Status report, including accounts details should be submitted to IHEC and extramural sponsors
5. In case of any new information or any SAE, which could affect any study, must be informed to IHEC and sponsors. The PI should report SAEs occurred for IHEC approved studies within 7 days of the occurrence of the SAE. If the SAE is 'Death', the IHEC Secretariat will receive the SAE reporting form within 24 hours of the occurrence
6. In the event of any protocol amendments, IHEC must be informed and the amendments should be highlighted in clear terms as follows:
    a. The exact alteration/amendment should be specified and indicated where the amendment occurred in the original project. (Page no. Clause no. etc.)
    b. Alteration in the budgetary status should be clearly indicated and the revised budget form should be submitted
    c. If the amendments require a change in the consent form, the copy of revised Consent Form should be submitted to Ethics Committee for approval
    d. If the amendment demands a re-look at the toxicity or side effects to patients, the same should be documented

PSG Institute of Medical Sciences & Research
Institutional Human Ethics Committee

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Phone : 91 422 - 2598822, 2570170, Fax : 91 422 - 2594400, Email : ihec@psgimsr.ac.in

e. If there are any amendments in the trial design, these must be incorporated in the protocol, and other study documents. These revised documents should be submitted for approval of the IHEC and only then can they be implemented

f. Any deviation-Violation/waiver in the protocol must be informed to the IHEC within the stipulated period for review

7. Final report along with summary of findings and presentations/publications if any on closure of the study should be submitted to IHEC

Thanking You,

Yours Sincerely,

SECRETARY
PSG IMS&R
COIMBATORE-641004.
INSTITUTIONAL HUMAN ETHICS COMMITTEE

Dr S Bhuvaneshwari
Member - Secretary
Institutional Human Ethics Committee

ANNEXURE II

ASSESSMENT FORM

Subject Number:

Date of Assessment:

DEMOGRAPHIC DATA:

Name: IP/OP Number:

Age: Contact number:

Sex:

Occupation:

Address:

SUBJECTIVE ASSESSMENT:

Chief complaints:

Present medical history:

Past medical history:

Personal history:

Family history:

PAIN HISTORY:

Site:

Side:

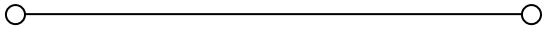
Onset:

Duration:

Type:

Aggravating factors:

Relieving factors:

VAS: (Visual Analog scale) 

OBJECTIVE ASSESSMENT:

ON OBSERVATION:

Built:

Posture:

Attitude of Limbs:

Muscle Wasting:

Deformity:

Tropical Changes:

External Appliances:

ON PALPATION:

Muscle spasm:

Tenderness:

Warmth:

Oedema:

ON EXAMINATION:

Motor examination:

Range of motion: (Goniometer)

Movements	Degrees	
SHOULDER	RIGHT	LEFT
Flexion		
Extension		
Abduction		
Adduction		
Medial rotation		
Lateral rotation		

ELBOW	RIGHT	LEFT
Flexion		
Extension		
WRIST	RIGHT	LEFT
Flexion		
Extension		

Muscle power: Manual muscle testing

SHOULDER	RIGHT	LEFT
Flexors		
Extensors		
Abductors		
Adductors		
Medial rotators		
Lateral rotators		
ELBOW		
Flexors		
Extensors		
WRIST		
Flexors		
Extensors		

Muscle grith: (inch tape-cms)

AREA	RIGHT	LEFT
Arm		
Forearm		

Sensory examination:

Superficial sensation:

Deep sensation:

SPECIAL TEST:

- Neers impingement test:
- Hawkin kennedy impingement test:
- Jobes suprespinatus test:

FUNCTIONAL ASSESSMENT:

Western Ontario rotator cuff index:

Repetitive maximum:

PROVISIONAL DIAGNOSIS:

PHYSIOTHERAPY MANAGEMENT:

OBJECTIVES:

TREATMENT PLAN:

a) Short term goal:

b) Long term goal:

TREATMENT GIVEN:

Date: Therapist signature:

FOLLOW UP CHART:

Name:

Age:

Sex:

IP/OP Number:

Date of assessment:

Date of follow up:

Specific complaints:

Treatment plan:

RESULTS	PRE-TEST	POST-TEST
VAS		
WORC		

Date: Therapist signature:

ANNEXURE III

PSG Institute of Medical Science and Research, Coimbatore
Institutional Human Ethics Committee
INFORMED CONSENT FORMAT FOR RESEARCH PROJECTS

I Ajitha.C.T carrying out a study on the topic: **Comparing the efficacy of open chain exercise versus closed chain exercise for reducing pain and improving the functional status in patients with rotator cuff tendinopathy** as part of my research project being carried out under the aegis of the Department of Orthopaedics & Physical Medicine and Rehabilitation.

My research guide is: Prof. R.Mahesh, MPT(Cardio Respiratory).

The justification for this study is:

Shoulder pain is the third most common musculoskeletal complaint encountered in clinical practice. One of the most common causes of shoulder pain is rotator cuff (RC) tendinopathy. Open chain exercise and closed chain exercise along with eccentric training helps to reduce the pain, strengthen the tendon and improve the functional status.

The objectives of this study are:

1.To determine the effects of open chain exercise in reducing pain and improving functional status in patients with rotator cuff tendinopathy.
2.To determine the effects of closed chain exercise in reducing pain and improving functional status in patients with rotator cuff tendinopathy.
3.To compare the effectiveness of open chain exercise versus closed chain exercise in reducing pain and improving functional status in patients with rotator cuff tendinopathy .

Sample size: 30.

Study volunteers / participants are subjects with rotator cuff tendinopathy, age group 30-60 years

Location: Department of Orthopedics and Department of PMR, PSG Hospitals.
We request you to kindly cooperate with us in this study. We propose collect background information and other relevant details related to this study. We will be carrying out:

Initial interview: 15 minutes.

Data collected will be stored for a period of 5 years. We will not use the data as part of another study.

Health education sessions: Number of sessions: 2. Approximate **duration** of each session: 15 minutes.

Clinical examination (Specify details and purpose): **Yes**

Blood sample collection: Specify quantity of blood being drawn: _____ml. **Not applicable**
No. of times it will be collected: _____.
Whether blood sample collection is part of routine procedure or for research (study) purpose:
1. Routine procedure 2. Research purpose
Specify **purpose**, discomfort likely to be felt and side effects, if any: _____
Whether blood sample collected will be stored after study period: Yes / No, it will be destroyed
Whether blood sample collected will be sold: Yes / No
Whether blood sample collected will be shared with persons from another institution: Yes / No

Medication given, if any, duration, side effects, purpose, benefits: **Not applicable**
Whether medication given is part of routine procedure: Yes / No (If not, state reasons for giving this medication)
Whether alternatives are available for medication given: Yes / No (If not, state reasons for giving this particular medication)

Final interview: 15 minutes.

Benefits from this study:

- Pain will be reduced.
- Range of motion will be improved.
- Shoulder Functional activities will be improved

Risks involved by participating in this study: There might be minimal chance of risks or discomforts experienced during this study. The discomforts may be stretch pain or exercise induced pain. In case of any discomfort Cryotherapy or Hot pack therapy will be given.

How the **results** will be used:

- Peer-reviewed scientific journals
- Conference presentation
- Internal report

If you are uncomfortable in answering any of our questions during the course of the interview / biological sample collection, **you have the right to withdraw from the interview / study at any time.** You have the freedom to withdraw from the study at any point of time. Kindly be assured that your refusal to participate or withdrawal at any stage, if you so decide, will not result in any form of compromise or discrimination in the services offered nor would it attract any penalty. You will continue to have access to the regular services offered to a

patient. You will **NOT** be paid any remuneration for the time you spend with us for this interview / study. The information provided by you will be kept in strict confidence. Under no circumstances shall we reveal the identity of the respondent or their families to anyone. The information that we collect shall be used for approved research purposes only. You will be informed about any significant new findings - including adverse events, if any, – whether directly related to you or to other participants of this study, developed during the course of this research which may relate to your willingness to continue participation.

Consent: The above information regarding the study, has been read by me/ read to me, and has been explained to me by the investigator/s. Having understood the same, I hereby give my consent to them to interview me. I am affixing my signature / left thumb impression to indicate my consent and willingness to participate in this study (i.e., willingly abide by the project requirements).

Signature / Left thumb impression of the Study Volunteer / Legal Representative:

Signature of the Interviewer with date: Witness:

Contact number of PI: 8870488033

Contact number of Ethics Committee Office: 0422 4345818

பூ. சா. கோ மருத்துவக் கல்லூரி மற்றும் ஆராய்ச்சி நிறுவனம், கோவை

மனித நெறிமுறைக் குழு

ஒப்புதல் படிவம்

தேதி:

அஜிதா.செ.த, ஆகிய நான்பூ. சா. கோ மருத்துவக் கல்லூரியின்இயன்முறைமருத்துவத்துறையின் கீழ், **"ஒப்பிட்டு திறன் மூலமாக திறந்த சங்கிலி உடற்பயிற்சி மற்றும்மூடிய சங்கிலி உடற்பயிற்சி நுட்பங்களை பயன்படுத்தி சுற்றுப்பட்டை டென்டினோபதியினால் ஏற்படும் வலியை குறைத்தல் மற்றும் செயல்பாட்டு நிலையை மேம்படுத்துதல்"** என்ற தலைப்பில் ஆய்வு மேற்கொள்ள உள்ளேன்.

என் ஆய்வு வழிகாட்டி:திரு. ரா. மகேஷ், முதல்வர், பூ.சா.கோ பிசியோதெரபி கல்லூரி

ஆய்வு மேற்கொள்வதற்கான அடிப்படை:

மருத்துவ நடைமுறையில் தோள்பட்டைவலி தசைக்கூட்டு புகார்களில் மூன்றாவதாக எதிர்கொள்ளபடுகிறது தோள்பட்டைவலி வருவதற்குரிய முக்கிய காரணங்களில் ஒன்று சுற்றுப்பட்டை டென்டினோபதி.மூடிய சங்கிலி உடற்பயிற்சி மற்றும் திறந்த சங்கிலி உடற்பயிற்சியின்மூலமாக தோள்பட்டை வலி குறைவதுடன் தசை நாண்கள் வலிமைப்பெற்று செயல் திறன் மேன்மையடைகிறது.

ஆய்வின் நோக்கம்:

எனது ஆய்வில் திறந்த சங்கிலி உடற்பயிற்சியை பயன்படுத்தி சுற்றுப்பட்டை டென்டினோபதி நோயாளிகளின் வலியை குறைத்தல் மற்றும் அன்றாட செயல் திறனை அதிகரித்தல்.

எனது ஆய்வில்மூடிய சங்கிலி உடற்பயிற்சியை பயன்படுத்தி சுற்றுப்பட்டை டென்டினோபதி நோயாளிகளின் வலியை குறைத்தல் மற்றும் அன்றாட செயல் திறனை அதிகரித்தல்.

ஒப்பிட்டு திறன் மூலமாக மூடிய சங்கிலி உடற்பயிற்சி மற்றும்மூடிய திறந்த சங்கிலி உடன்பயிற்சிகளை பயன்படுத்தி சுற்றுப்பட்டை டென்டினோபதி நோயாளிகளின் வலி குறைத்தல் மற்றும் அன்றாட செயல் திறனை அதிகரித்தல்.

ஆய்வில்பங்கு பெறும் நபர்களின் எண்ணிக்கை: 30

ஆய்வில்பங்கு பெறுவோர் மற்றும் வயது: 30-60 வயதுக்குட்பட்ட, சுற்றுப்பட்டை டெண்டினோபதி நோயாளிகள்.

ஆய்வு மேற்கொள்ளும் இடம்:எலும்பு முறிவு பிரிவு மற்றும்புனர்வாழ்வு மருத்துவதுறைகள், பூ.சா.கோ. மருத்துவமனை, கோயம்புத்தூர்.

இந்த ஆய்வில் எங்களுடன் ஒத்துழைக்குமாறு கேட்டுக்கொள்கிறோம். நாங்கள் சில தகவல்களை இந்த ஆய்விற்காக சேகரிக்க உள்ளோம்.

ஆய்வு செய்யப்படும் முறை:

எனது ஆய்வின் மொத்த கால அளவு 9 மாதம்.

இந்த ஆய்வில் சுற்றுப்பட்டை டென்டினோபதி உள்ள நோயாளிகளை 15 நபர்கள் கொண்ட இருகுழுக்களாக பிரித்துக் கொள்வேன்.

பின்னர் தோள்பட்டையின் வலி VAS மற்றும் WORC மூலம் மதிப்பிடப்படும்.

அதன் பின் திறந்த சங்கிலி பயிற்சி (அ) மூடிய சங்கிலி பயிற்சி 40 நிமிடம் வீதம் வாரம் 3 நாட்களுக்கு 4 வாரத்திற்கு மேற்கொள்ளப்படும்.

4 வாரத்தின் முடிவில் எடுக்கப்படும் முடிவுகள் ஆரம்ப மதிப்பீட்டுடன் ஒப்பிடப்படும்.

முதன்மை நேர்காணல்:15 நிமிடங்கள்
இந்த ஆய்வில் கிடைக்கும் தகவல்கள் **5 வருடங்கள்** பாதுகாக்கப்படும்.இந்த தகவல்கள் வேறு ஆய்விற்குப் பயன்படுத்தப் பட மாட்டாது.

முடிவு நேர்காணல்:15 நிமிடங்கள்
சுகாதாரக் கல்வி: அமர்வுகள்: 2 முறை ஒரு அமர்வுக்கான நேரம்: 15 நிமிடங்கள்
மருத்துவ பரிசோதனைகள்: உள்ளது

இரத்த மாதிரி சேகரிப்பு: _____ மிலி _____ முறை**பொருந்தாது**

இரத்த மாதிரி எடுப்பதுவழக்கமான சிகிச்சைக்காகவோ அல்லது இந்த ஆய்விற்காகவோ:

பொருந்தாது

இதனால் ஏற்படக் கூடிய அசௌகரியங்கள் / பக்க விளைவுகள்: இதனால் எந்த அசௌகரியமோ, பக்க விளைவுகளோ ஏற்படாது.**பொருந்தாது**

இரத்த மாதிரிகள் ஆய்விற்குப்பின் பாதுகாத்து வைக்கப்படுமா? ஆம் / இல்லை, அழிக்கப்படும்: **பொருந்தாது**

சேகரிக்கப்பட்ட இரத்தம் விற்கப்படுமா? ஆம் / இல்லை **பொருந்தாது**

சேகரிக்கப்பட்ட இரத்தம் வேறு நிறுவனத்துடன் பகிர்ந்து கொள்ளப்படுமா? ஆம் / இல்லை: **பொருந்தாது**

மருந்துகள் ஏதேனும் கொடுக்கப்படவிருந்தால் அவை பற்றியவிவரம் (கொடுக்கப்படும் காரணம்,காலம், பக்க விளைவுகள், பயன்கள்): **பொருந்தாது**
மருந்துகள் கொடுக்கப்படுவதுவழக்கமான சிகிச்சை முறையா?: ஆம் / இல்லை (இல்லை என்றால்கொடுக்கப்படும் காரணம்) **பொருந்தாது**

கொடுக்கப்படும்மருந்துகளுக்குமாற்றுஉள்ளதா?: ஆம் / இல்லை (ஆம் என்றால் இந்த குறிப்பிட்ட மருந்து கொடுக்கப்படும் காரணம்)**பொருந்தாது**

ஆய்வில் பங்குபெறுவதால் ஏற்படும் பலன்கள்:

- தோள்பட்டையின் வலியின் அளவு குறையும்.
- தசைநார்கள் வலிமைபெறும்.
- அன்றாட செயல்திறன் அதிகரிக்கும் என எதிர்பார்க்கப்படுகிறது

ஆய்வினால் ஏற்படக் கூடிய அசௌகரியங்கள் / பக்க விளைவுகள்: இதனால் எந்த அசௌகரியமோ, பக்க விளைவுகளோ ஏற்படாது.**தோள்பட்டையின் பயிற்சியின்பாது ஏதேனும் வலி ஏற்பட்டால் அதற்கு வெந்நீர் ஒத்தடம் கொடுக்கப்படும்.**

ஆய்வின் முடிவுகள் எந்த முறையில் பயன்படுத்தப்படும்?

இந்த ஆய்வின்மூலம் கிடைக்கும் தகவல்கள் தங்களின் புகைப்படத்துடன் தங்களின் அடையாளம் அறியாவண்ணம் அகநிலை அறிக்கை (Internal report), கலந்தாய்வுகள் (Conference),அறிவியல் சார்ந்த ஆராய்ச்சிப் பத்திரிக்கைகளில்(Journals)வெளியிடப்படும்.இதற்கு தங்களின் அனுமதி கோருகிறேன்.

இந்த ஆய்வின் கேள்விகளுக்கு பதிலளிப்பதில் உங்களுக்கு ஏதேனும் அசௌகரியங்கள் இருந்தால், எந்த நேரத்தில் வேண்டுமானாலும் ஆய்விலிருந்து விலகிக்கொள்ளும் உரிமை உங்களுக்கு உண்டு. ஆய்விலிருந்து விலகிக்கொள்வதால் உங்களுக்கு அளிக்கப்படும் சிகிச்சை முறையில் எந்த வித பாதிப்பும் இருக்காது என்று உங்களுக்கு உறுதியளிக்கிறோம். மருத்துவமனையில் நோயாளிகளுக்கு அளிக்கப்படும் சேவைகளை நீங்கள் தொடர்ந்து பெறலாம். இந்த ஆய்வில்பங்கேற்க ஒப்புக்கொள்ளுவதால் வேறு எந்த விதமான கூடுதலான பலனும் உங்களுக்குக் கிடைக்காது. நீங்கள் அளிக்கும் தகவல்கள் இரகசியமாக வைக்கப்படும். ஆய்வில்பங்கேற்பவர்கள் பற்றியோ அவர்கள் குடும்பத்தைப் பற்றியோ எந்தத் தகவலும் எக்காரணம் கொண்டும் வெளியிடப்படாது என்று உறுதியளிக்கிறோம். நீங்கள் அளிக்கும் தகவல்கள் அங்கீகரிக்கப்பட்ட ஆய்விற்குமட்டுமே பயன்படுத்தப்படும்.இந்த ஆய்வு நடைபெறும் காலத்தில் குறிப்பிடத்தகுந்த புதிய கண்டுபிடிப்புகள் அல்லதுபக்க விளைவுகள் ஏதும் ஏற்பட்டால் உங்களுக்குத் தெரிவிக்கப்படும்.இதனால் ஆய்வில் தொடர்ந்து பங்கு பெறுவது பற்றிய உங்கள் நிலைப்பாட்டை நீங்கள் தெரிவிக்க ஏதுவாகும்.

ஆய்வுக்குட்படுபவரின் ஒப்புதல்: இந்த ஆய்வைப்பற்றிய மேற்கூறிய தகவல்களை நான் படித்து அறிந்து கொண்டேன் / ஆய்வாளர் படிக்கக் கேட்டுத் தெரிந்து கொண்டேன். ஆய்வினைப்பற்றி நன்றாகப் புரிந்து கொண்டு இந்த ஆய்வில்பங்கு பெற ஒப்புக்கொள்கிறேன்.இந்த ஆய்வில்பங்கேற்பதற்கான எனது ஒப்புதலை கீழே கையொப்பமிட்டு.கை ரேகை பதித்து நான் தெரிவித்துக் கொள்கிறேன்.

பங்கேற்பாளரின் பெயர், முகவரி:

பங்கேற்பாளரின் கையொப்பம் / கை ரேகை / சட்டப்பூர்வ பிரதிநிதியின் கையொப்பம்:

தேதி :

ஆய்வாளரின் கையொப்பம்:

தேதி :

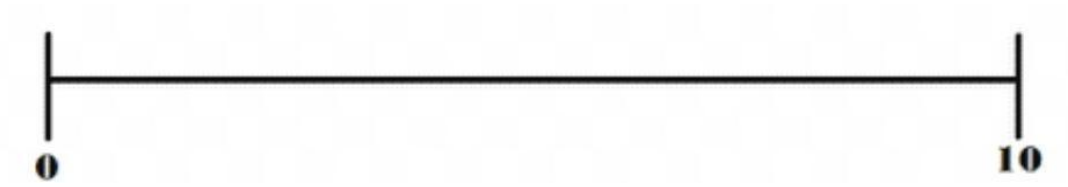
ஆய்வாளரின் தொலைபேசி எண்: 8870488033

மனித நெறிமுறைக் குழு அலுவலகத்தின் தொலைபேசி எண்:

அலுவலக நேரத்தில்0422 2570170 Extn.: 5818

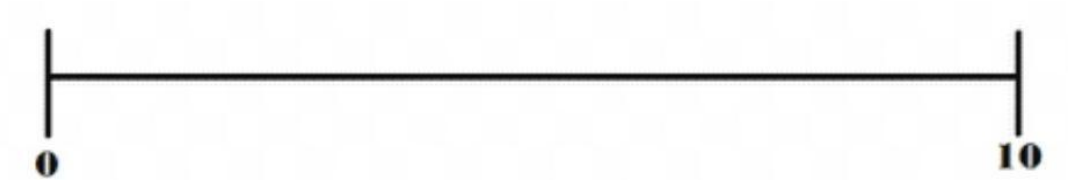
ANNEXURE-IV

VISUALANALOGUESCALE



NoPain **Worstpossiblepain**

காட்சி அனலாக் அளவில்



வலி இல்லை மிகுதியான வலி

மேற்கத்திய ஒன்டாரியோ சுற்றுப்பட்டை குறியீடு

பிரிவு-அ உடல் நிலை அறிகுறிகள்

1. எவ்வளவு கூர்மையான வலியை நீங்கள் உங்கள் தோள்பட்டையில் அனுபவிக்கிறீர்கள்?
   வலி இல்லை ├──────────────────────────────┤ மிகுதியான வலி

2. எவ்வளவு நிலையான நச்சரிக்கும் வலியை நீங்கள் உங்கள் தோள்பட்டையில் அனுபவிக்கிறீர்கள்?
   வலி இல்லை ├──────────────────────────────┤ மிகுதியான வலி

3. உங்கள் தோள்பட்டை எவ்வளவு பலவீனமாக இருக்கிறது?
   பலவீனம்இல்லை ├──────────────────────────────┤ மிகுதியான பலவீனம்

4. உங்கள் தோள்பட்டையில் எவ்வளவு விரைப்பு (அல்லது) இயக்க வரம்பில்பற்றாக்குறை ஏற்பட்டுள்ளது?
   விரைப்புத்தனமை ├──────────────────────────────┤ மிகுதியான
   இல்லை விரைப்புத்தனமை

5. உங்கள் தோள்பட்டையில் ஏற்படும் கிளிக், அரைக்கும்மற்றும் துன்புறுத்தல் மூலம் நீங்கள் எவ்வளவு கவலை அடைந்து இருக்கிறீர்கள்?
   இல்லை ├──────────────────────────────┤ மிகுதியாக இருக்கிறது

6. உங்கள் தோள்பட்டையில் எவ்வளவு கோளாறுகளை / அசௌகரியங்களை நீங்கள் அனுபவிக்கிறீர்கள்?
   அசௌகரியம் ├──────────────────────────────┤ மிகுதியான
   இல்லை அசௌகரியம்

பிரிவு-ஆ விளையாட்டு / பொழுதுபோக்கு

7. உங்கள் தோள்பட்டையின் நிலை எவ்வளவு உங்களது உடற்பயிற்சியின் நிலையை பாதித்துள்ளது?
   பாதிப்பு இல்லை ├──────────────────────────────┤ மிகுதியான பாதிப்பு

8. புஸ் அப்ஸ் (அல்லது) பிற கடுமையான தோள்பட்டை உடற்பயிற்சி செய்யும் பொழுது எவ்வளவு சிரமம் அடைகிறீர்கள்?
   சிரமம்இல்லை ├──────────────────────────────┤ மிகுதியான சிரமம்

9. உங்கள் தோள்பட்டையின் நிலை கடினமாக தூக்கி எறியும் திறனை எவ்வளவு பாதித்துள்ளது?
   பாதிப்பு இல்லை ├──────────────────────────────┤ மிகுதியான பாதிப்பு

10. உங்கள் பாதிக்கப்பட்ட தோள்பட்டையை யாராவது (அ) எதாவது நேர்நிலையில் தொடர்பு கொள்ளும் போது எவ்வளவு சிரமம் அடைகிறீர்கள்?

பயம்இல்லை ├──────────────────────────────┤ மிகுதியான பயம்

பிரிவு-இ வேலை

11. நீங்கள் உங்கள் தினசரி நடவடிக்கைகளான வீடு மற்றும் முற்றத்தில் செய்யும் வேலைகளில் எவ்வளவு சிரமம் அனுபவிக்கிறீர்கள்?

சிரமம்இல்லை ├──────────────────────────────┤ மிகுதியான சிரமம்

12. கைகளை உங்கள் தோள்களின் மேலே தூக்கி, வேலை செய்யும் போது எவ்வளவு சிரமம் அனுபவிக்கிறீர்கள்?

சிரமம்இல்லை ├──────────────────────────────┤ மிகுதியான சிரமம்

13. உங்கள் பழுதுபட்ட கையை ஈடு செய்ய பழுதற்ற கையை எவ்வளவு பயன்படுத்துகிறீர்கள்?

இல்லவேஇல்லை ├──────────────────────────────┤ நிரந்தரமாக உள்ளது

14. நீங்கள் கனரக பொருட்களை தோள்பட்டையின் நிலையில் (அ) அதன் மேலே தூக்கும் பொழுது எவ்வளவு அசௌகரியமாக உணர்கிறீர்கள்?

சிரமம்இல்லை ├──────────────────────────────┤ மிகுதியான சிரமம்

பிரிவு-ஈ வாழ்வு முறை

15. தோள்பட்டையின் வலியினால் உங்கள்தூக்கம் எவ்வளவு பாதிக்கப்படுகிறது?

சிரமம்இல்லை ├──────────────────────────────┤ மிகுதியான சிரமம்

16. சிகை அலங்காரம் செய்யும் பொழுது உங்களுடைய தோள்பட்டையின் காரணமாக எவ்வளவு சிரமம் அனுபவிக்கிறீர்கள்?

சிரமம்இல்லை ├──────────────────────────────┤ மிகுதியான சிரமம்

17. நண்பர்களுடனும் (அ) குடும்பத்தாருடனும் சுற்றும் பொழுது எவ்வளவு சிரமமாக உணர்கிறீர்கள்?

சிரமம்இல்லை ├──────────────────────────────┤ மிகுதியான சிரமம்

18. ஆடைகளை மாற்றும் பொழுது (உடுத்தும் / கழுற்றும்) எவ்வளவு கடினமாக உள்ளது?

சிரமம்இல்லை ├──────────────────────────────┤ மிகுதியான சிரமம்

பிரிவு-உஉணர்ச்சி

19. உங்கள் தோள்பட்டையினால் மனதளவில் எவ்வளவு விரக்தியடைந்து உள்ளீர்கள்

விரக்தி இல்லை ——————————— மிகுதியான விரக்தி

20. உங்கள் தோள்பட்டையின் நிலையினால் எவ்வளவு மனசோர்வு அடைந்து இருக்கிறீர்கள்?

மன்ச்சோர்வு ——————————— மிகுதியான
இல்லை மனச்சோர்வு

21. உங்கள் தோள்பட்டையின் நிலையினால் உங்களுடைய கவலை (அ) அக்கறையின் நிலை எந்த அளவுக்கு உங்கள் வேலையை பாதிக்கிறது?

அக்கறை இல்லை ——————————— மிகுதியான அக்கறை

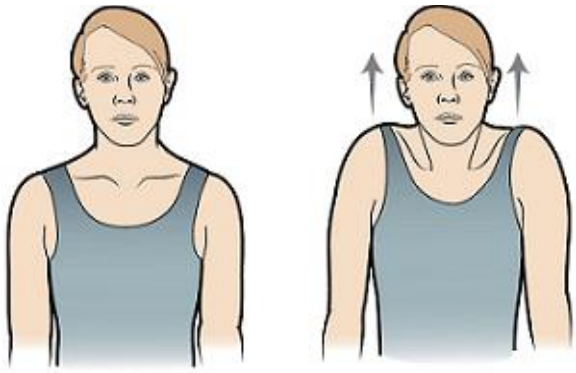
ANNEXURE V

EXERCISE PROTOCOL

WARM UP EXERCISES

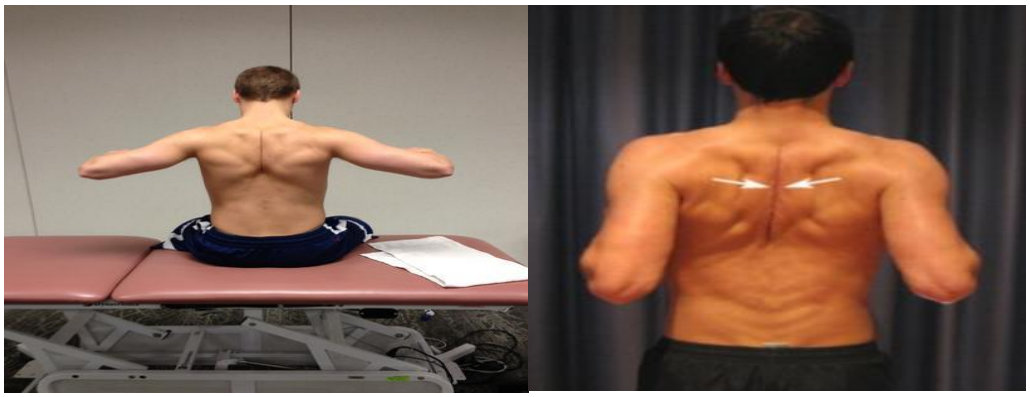
SHOULDER SHRUGS

- Stand erect and arms at side. Elevate only the shoulders as high as possible and hold it for 2-3 seconds. Then slowly lower your shoulder to original position.



SHOULDER BRACING

- Stand erect. Shoulders abducted to 90º and elbows flexed slightly. Now move the hands across the chest forwards and then backwards as much as possible.



SHOULDER CIRCLES

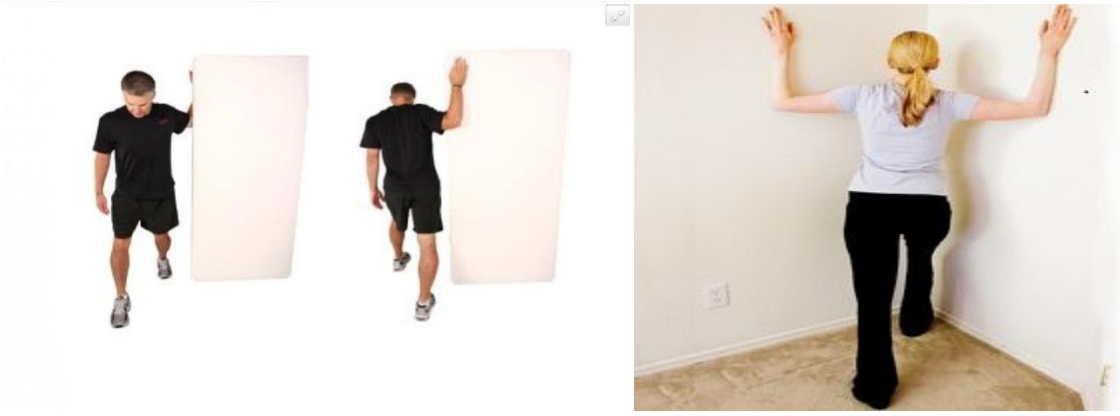
- Standing or sitting erect. Place your hands on the shoulder. Now move the elbow in circular manner both in clockwise and anticlock wise direction.

TRAPEZIUS STRETCHING

- Standing or sitting erect. For right side trapezius stretch lower your left ear towards your left shoulder. To prevent the lifting of the right shoulder the right hand is placed behind your back or hold the chair behind. Now using your left hand gently press your head and hold it for 30-40 seconds. Then slowly release the stretch and get back to original position.

PECTORALIS STRETCHING

- Stand at the corner of the wall or at the door step. Shoulders are abducted to 90º and elbow to 90º now place the forearm on each side of the door step. Slowly lean forward or shift your weight forwards. Hold it for 20-30 seconds. Then slowly release the stretch and get back to original position.



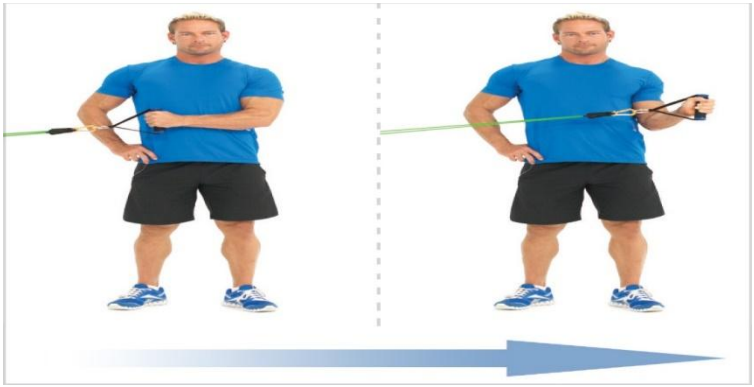
OPEN CHAIN EXERCISE

SHOULDER ABDUCTION USING THERABAND

- Stand erect. Hold the end of the theraband under your feet. Grasp the other end of the theraband in your hand. By keeping the elbows erect lift your hand outwards as much as possible.

SHOULDER EXTERNAL ROTATION USING THERABAND

- Stand erect elbows flexed to 90º. Place a towel roll at your elbow. Anchor the theraband on to some object. Now slowly pull the theraband away from the body.



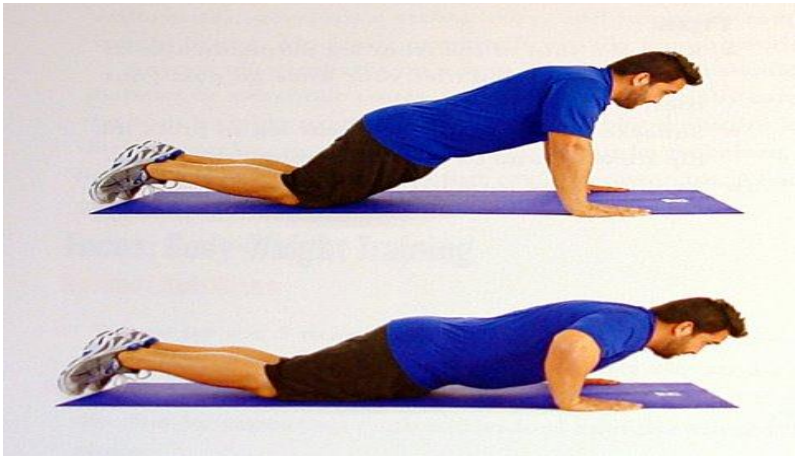
CLOSED CHAIN EXERCISE

WALL PUSH UPS

- Stand facing the wall with your palm placed flat against the wall at the shoulder level. Slowly bend your elbows and lean your upper body forwards as much as possible. Then slowly get back to its original position.

PUSH UP IN 4 POINT KNEELING

- Quadripod position. The hands are placed firmly on the ground. Now slowly lower your upper body as much as possible towards the ground by bending the elbow. Then get back to the original position.



SEATED PUSH UPS

- Sitting in an arm chair comfortably with elbows and hand resting on the arm rests. Now slowly raise your upper body off the chair by pressing your hands against the chair. Then slowly lower your body to the chair

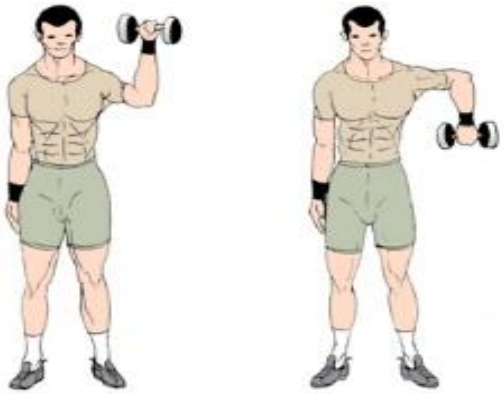
ECCENTRIC TRAINING

SHOULDER ABDUCTION USING WEIGHTS

- Stand erect shoulder abducted to 90º. Holding weights in your hands slowly lower the hands towards the body.

SHOULDER EXTERNAL ROTATION USING WEIGHTS

- Stand erect shoulder abducted to 90º and elbows flexed to 90º. Holding weights in your hands slowly lower the weight forwards and downwards.



ROLLING BALL ON THE WALL

- Stand erect. Hold the ball in the hand against the wall. Push the hand against the ball gently and straighten your arms. Slowly roll the ball overhead without elevating the shoulder then roll it sideways and make a circle without taking the hands off the ball.

COMPARE THE EFFICACY OF OPEN CHAIN EXERCISE VERSUS CLOSED CHAIN EXERCISE IN REDUCING PAIN AND IMPROVING THE FUNCTIONAL STATUS IN PATIENTS WITH ROTATOR CUFF TENDINOPATHY

ABSTRACT

Background: Shoulder pain is the third most common musculoskeletal complaint encountered in clinical practice. Prevalence studies indicate that 16 to 34 percent of the general population suffers from shoulder pain. The most common causes of shoulder pain are rotator cuff (RC) tendinopathy /shoulder impingement syndrome (SIS). Research has demonstrated moderate evidence for exercise in the treatment of rotator cuff (RC) tendinopathy. Eccentric training has been proposed as an effective conservative treatment for the Achilles and patellar tendinopathies, but less evidence exists about its effectiveness for the rotator cuff tendinopathy. Open chain and closed chain exercises seem to be effective in bringing about short term changes in pain and disability in patients with rotator cuff tendinopathy.

Objectives: To compare the efficacy of open chain exercise versus closed chain exercise in reducing pain and improving the functional status in patients with rotator cuff tendinopathy.

Design: Randomized clinical trial.

Setting: Department of Physical Therapy and rehabilitation and Department of orthopedic medicine, P.S.G Hospital, Coimbatore

Participants: 30 patients with shoulder pain for at least three months duration. Pain was reproduced on stressing the rotator cuff and participants had full passive range of movement at the shoulder.

Interventions: Group A received Open chain exercises (OC) with eccentric training and Group B received Closed chain exercises (CC) with eccentric training. **Outcomes** were measured using Visual analogue scale [VAS] and Western Ontario rotator cuff index [WORC].

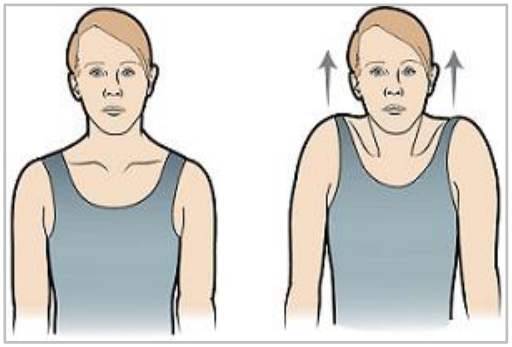
Result: The calculated value of paired 't' test for VAS of group A is 6.50 and for group B is 8.34 which is greater than the table value indicating there is a significant difference within both the group. The value of independent t test for both groups are 1.51 which is less than the table value indicating there is no significant difference between the groups. The calculated value of paired't'test for WORC of group A is -8.53 and for group B is -11.72 which is greater than the table value indicating there is a significant difference within both the group. The value of independent t test for both groups are -3.84 which is greater than the table value indicating there is significant difference between the groups

Conclusion: Thus the statistical analysis of data concluded that **"Closed chain exercise group shows statistically significant improvement on functional status compared to Open chain exercise group, whereas there was statistically no significant difference in both Closed chain exercise and Open chain exercise group on pain"**

Key words: closed chain exercise, open chain exercise, eccentric training, rotator cuff tendinopathy.

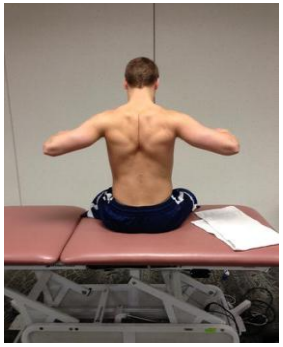
WARM UP EXERCISES

Shoulder Shrugs



Stand erect and arms at side. Elevate only the shoulders as high as possible and hold it for 2-3 seconds. Then slowly lower your shoulder to original position.

Shoulder Bracing



Stand erect. Shoulders abducted to 90º and elbows flexed slightly. Now move the hands across the chest forwards and then backwards as much as possible.

Shoulder Circles

Standing or sitting erect. Place your hands on the shoulder. Now move the elbow in circular manner both in clockwise and anticlock wise direction.

Trapezius Stretching

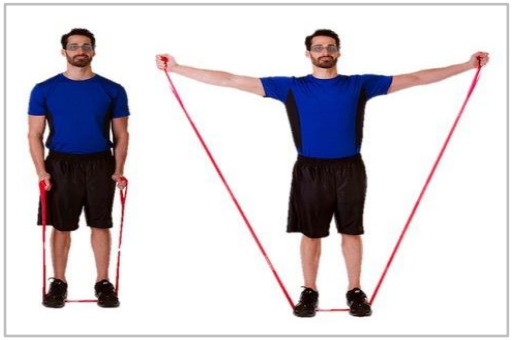
Standing or sitting erect. For right side trapezius stretch lower your left ear towards your left shoulder. To prevent the lifting of the right shoulder the right hand is placed behind your back or hold the chair behind. Now using your left hand gently press your head and hold it for 30-40 seconds. Then slowly release the stretch and get back to original position.

Pectoralis Stretching

Stand at the corner of the wall or at the door step. Shoulders are abducted to 90º and elbow to 90º now place thw forearm on each side of the door step. Slowly lean forward or shift your weight forwards. Hold it for 20-30 seconds. Then slowly release the stretch and get back to original position.

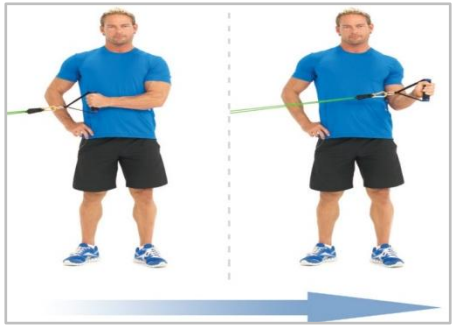
OPEN CHAIN EXERCISE

Shoulder abduction using theraband



Stand erect. Hold the end of the theraband under your feet. Grasp the other end of the theraband in your hand. By keeping the elbows erect lift your hand outwards as much as possible.

Shoulder external rotation using theraband



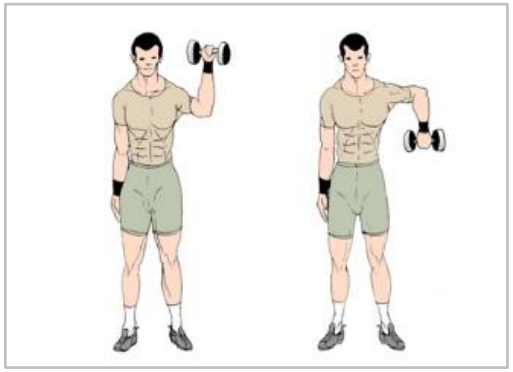
Stand erect elbows flexed to 90º. Place a towel roll at your elbow. Anchor the theraband on to some object. Now slowly pull the theraband away from the body.

ECCENTRIC TRAINING

Shoulder abduction using weights

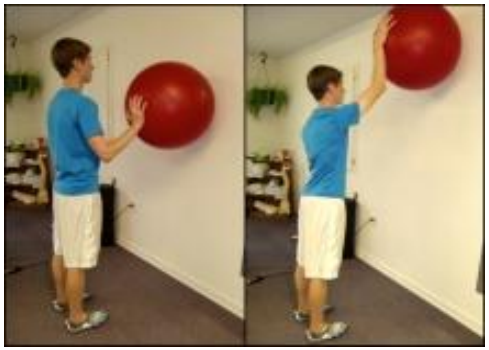
Stand erect shoulder abducted to 90º. Holding weights in your hands slowly lower the hands towards the body.

Shoulder external rotation using weights



Stand erect shoulder abducted to 90º and elbows flexed to 90º. Holding weights in your hands slowly lower the weight forwards and downwards.

Rolling ball on the wall



Stand erect. Hold the ball in the hand against the wall. Push the hand against the ball gently and straighten your arms. Slowly roll the ball overhead without elevating the shoulder then roll it sideways and make a circle without taking the hands off the ball.

COMPARING THE EFFICACY OF OPEN CHAIN EXERCISE VERSUS CLOSED CHAIN EXERCISE IN REDUCING PAIN AND IMPROVING THE FUNCTIONAL STATUS IN PATIENTS WITH ROTATOR CUFF TENDINOPATHY

Prepared By

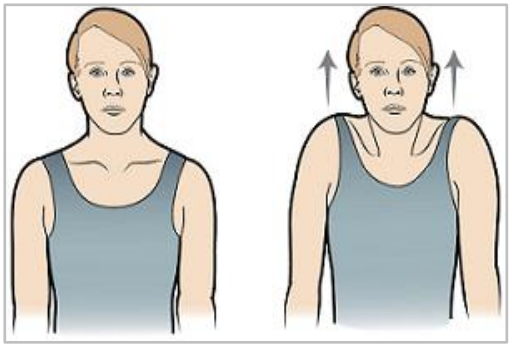
Ajitha C T

II-Year, MPT

PSG College of Physiotherapy

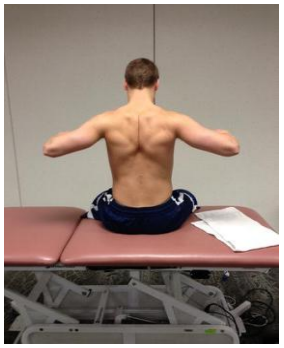
தயாராகும் உடற்பயிற்சி

தோள்பட்டை ஷ்ரக்



நேராக நின்று உங்கள் தோள்பட்டையை பக்கவாட்டில் காதுகள் வரை இயர்த்தி மூன்று நொடிகள் வைத்து பின்பு இறக்கவும்

தோள்பட்டை ப்ரேசிங்



நேராக நின்று முழங்கைகளை மடக்கியவாறு கைகளை தோள் பட்டைக்கு சமமாக பக்கவாட்டில் உயர்த்தி உள்ளும் வெளியுமாக அசைக்கவும்.

தோள்பட்டை வட்டங்கள்

நேராக நின்று கைகளை மடக்கி விரல்களை தோள்பட்டையில் வைத்து மடக்கிய கைகளை நன்றாக சுழற்றவும்.

தட்டையான தசை நீட்சி

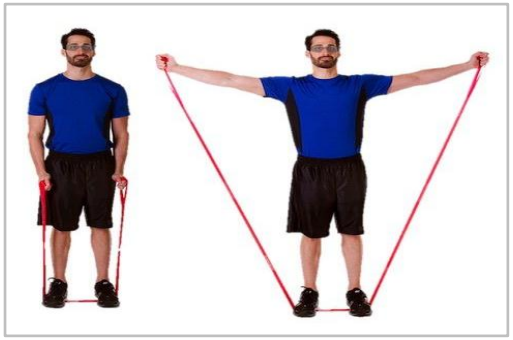
நேராக நின்று ஒரு கையை பின்புறத்தில் வைக்கவும். பின்பு தலையை மறுபக்கமாக சாய்த்து, மற்றொரு கையை தலையின் மேல் வைத்து 20-30 நொடிகள் அழுத்தியபடி வைக்கவும்.

மார்பு தசை நீட்சி

சுவற்றின் மூலையில் நின்று கைகளை சுவற்றில் வைக்கவும், முழங்கைகளை மடக்கியவாறு உடலை முன்பாக 20-30 நொடிகளுக்கு சாய்த்து நிற்கவும் மெதுவாக இருப்பு நிலைக்கு வரவும்.

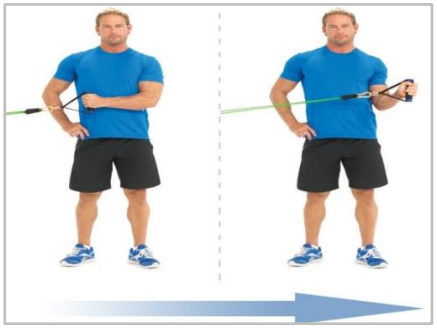
திறந்த சங்கிலி உடற்பயிற்சி

தோள்பட்டை கடத்தல்



நேராக நின்று தெராபேண்டின் ஒரு முனையை காலின் அடியில் வைத்து, மறுமுனையை கையில் பிடித்து பக்கவாட்டில் உயர்த்தவும்.

தோள்பட்டை வெளிப்புற சுழற்சி



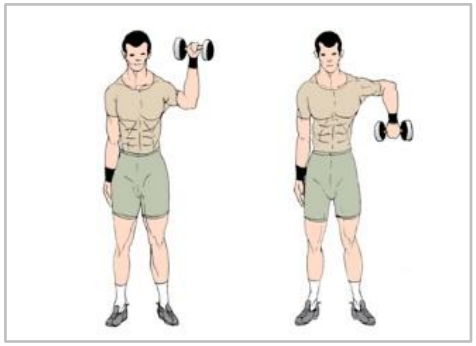
நேராக நின்று முழங்கைகளை மடக்கி துண்டை சுருட்டி பக்கவாட்டில் கைகளுக்கு இடையில் வைக்கவும் தெராபேண்டை பொருத்தி கைகளை உடலுக்கு வெளியாக இழுக்கவும்.

எக்சென்ட்ரிக் பயிற்சி

தோள்பட்டை கடத்தல்

நேராக நின்று கைகளில் கனமான பொருளை ஏந்தி பக்கவாட்டின் மேலிருந்து கைகளை தாழ்த்தி உடலின் அருகில் கொண்டு வரவும்.

தோள்பட்டை வெளிப்புற சுழற்சி



நேராக நின்று கைகளில் கனமான பொருளை ஏந்தி கைகளை பக்கவாட்டில், தோள்ப்பட்டையின் நிலையில் உயர்த்தி முழங்கைகளை 90° மடக்கவும். இப்பொழுது கைகளை கீழ்நோக்கி சுழற்றவும்.

சுவர் எதிராக பந்தை உருட்டுதல்

நேராக நின்று கைகளில் உள்ள பந்தை சுவற்றில் வைத்து அதை அழுத்தியபடி மேலும் கீழுமாகவும், வலது மற்றும் இடதுபுறமாகவும் உருட்டவும்.

ஒப்பிட்டு திறன் மூலமாக திறந்த சங்கிலி உடற்பயிற்சி மற்றும் மூடிய சங்கிலி உடற்பயிற்சி நுட்பங்களை பயன்படுத்தி சுற்றுப்பட்டை டென்டினோபதியினால் ஏற்படும் வலியை குறைத்தல் மற்றும் செயல்பாட்டு நிலையை மேம்படுத்துதல்

தயாரித்தவர்

அஜிதா.செ.த,

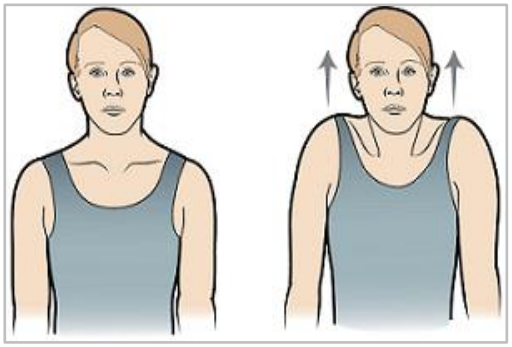
இரண்டாம் ஆண்டு,

முதுகலை இயன்முறை மருத்துவம்

பூ சா கோ இயன்முறை மருத்துவக் கல்லூரி

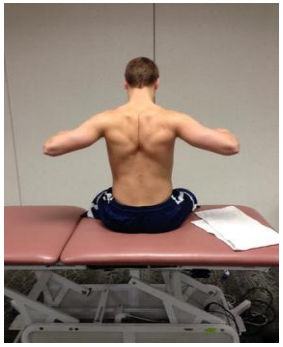
WARM UP EXERCISES

Shoulder Shrugs



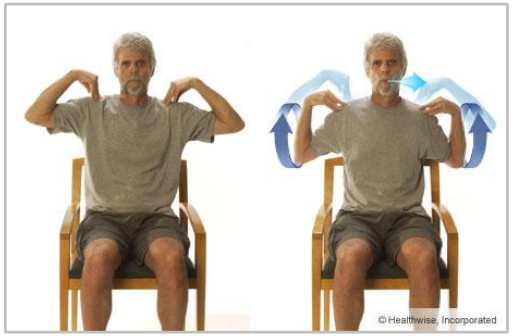
Stand erect and arms at side. Elevate only the shoulders as high as possible and hold it for 2-3 seconds. Then slowly lower your shoulder to original position.

Shoulder Bracing



Stand erect. Shoulders abducted to 90º and elbows flexed slightly. Now move the hands across the chest forwards and then backwards as much as possible.

Shoulder Circles



Standing or sitting erect. Place your hands on the shoulder. Now move the elbow in circular manner both in clockwise and anticlock wise direction.

Trapezius Stretching

Standing or sitting erect. For right side trapezius stretch lower your left ear towards your left shoulder. To prevent the lifting of the right shoulder the right hand is placed behind your back or hold the chair behind. Now using your left hand gently press your head and hold it for 30-40 seconds. Then slowly release the stretch and get back to original position.

Pectoralis Stretching

Stand at the corner of the wall or at the door step. Shoulders are abducted to 90º and elbow to 90º now place thw forearm on each side of the door step. Slowly lean forward or shift your weight forwards. Hold it for 20-30 seconds. Then slowly release the stretch and get back to original position.

CLOSED CHAIN EXERCISE

Wall push ups

Stand facing the wall with your palm placed flat against the wall at the shoulder level. Slowly bend your elbows and lean your upper body forwards as much as possible. Then slowly get back to its original position.

Push up in 4 point kneeling

Quadripod position. The hands are placed firmly on the ground. Now slowly lower your upper body as much as possible towards the ground by bending the elbow. Then get back to the original position.

Seated push ups

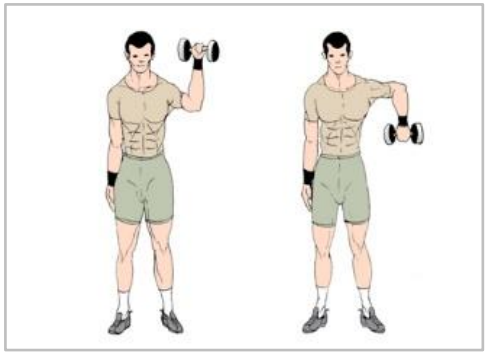
Sitting in an arm chair comfortably with elbows and hand resting on the arm rests. Now slowly raise your upper body off the chair by pressing your hands against the chair. Then slowly lower your body to the chair

ECCENTRIC TRAINING

Shoulder abduction using weights

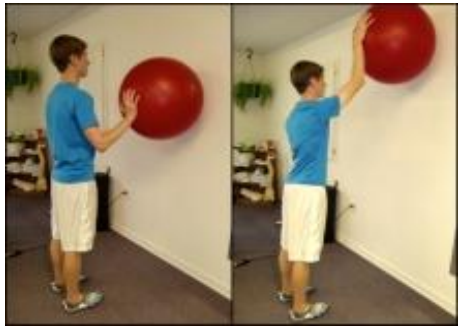
Stand erect shoulder abducted to 90º. Holding weights in your hands slowly lower the hands towards the body.

Shoulder external rotation using weights



Stand erect shoulder abducted to 90º and elbows flexed to 90º. Holding weights in your hands slowly lower the weight forwards and downwards.

Rolling ball on the wall



Stand erect. Hold the ball in the hand against the wall. Push the hand against the ball gently and straighten your arms. Slowly roll the ball overhead without elevating the shoulder then roll it sideways and make a circle without taking the hands off the ball.

COMPARING THE EFFICACY OF OPEN CHAIN EXERCISE VERSUS CLOSED CHAIN EXERCISE IN REDUCING PAIN AND IMPROVING THE FUNCTIONAL STATUS IN PATIENTS WITH ROTATOR CUFF TENDINOPATHY

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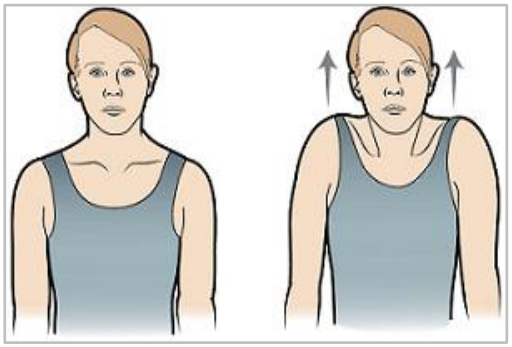
தோள்பட்டை ஷ்ரக்



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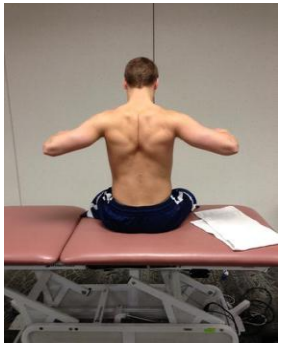
தோள்பட்டை ப்ரேசிங்



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தோள்பட்டை வட்டங்கள்

நேராக நின்று கைகளை மடக்கி விரல்களை தோள்பட்டையில் வைத்து மடக்கிய கைகளை நன்றாக சுழற்றவும்.

தட்டையான தசை நீட்சி

நேராக நின்று ஒரு கையை பின்புறத்தில் வைக்கவும். பின்பு தலையை மறுபக்கமாக சாய்த்து, மற்றொரு கையை தலையின் மேல் வைத்து 20-30 நொடிகள் அழுத்தியபடி வைக்கவும்.

மார்பு தசை நீட்சி

சுவற்றின் மூலையில் நின்று கைகளை சுவற்றில் வைக்கவும், முழங்கைகளை மடக்கியவாறு உடலை முன்பாக 20-30 நொடிகளுக்கு சாய்த்து நிற்கவும் மெதுவாக இருப்பு நிலைக்கு வரவும்.

மூடிய சங்கிலி உடற்பயிற்சி

சுவர் புஷ் அப்கள்

சுவரை பார்த்து நின்று உள்ளங்கைகளை தோள்பட்டையின் நிலையில் சுவரின் மீது வைக்கவும் முழங்கைகளை மடக்கியவாறு உடலை முன்புறமாக செலுத்தி பின்பு இயல்பு நிலைக்கு வரவும்.

நான்கு கால் புஷ் அப்கள்

தவழும் நிலையில் நின்று முழங்கைகளை மடக்கியவாறு உடலை தாழ்த்தவும், பின்பு இயல்பு நிலைக்கு வரவும்.

அமர்ந்துகொண்டு புஷ் அப்கள்

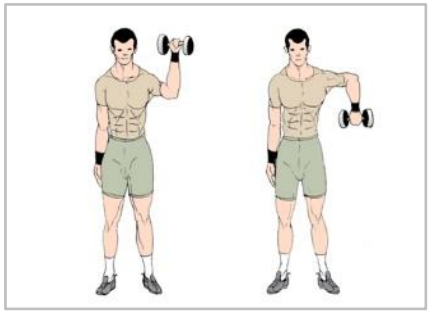
நாற்காலியில் அமரவும் கைகளை நாற்காலியில் அழுத்தியவாறு உடலை மேலே உயர்த்தவும் பின்பு இயல்பு நிலைக்கு வரவும்.

எக்சென்ட்ரிக் பயிற்சி

தோள்பட்டை கடத்தல்

நேராக நின்று கைகளில் கனமான பொருளை ஏந்தி பக்கவாட்டின் மேலிருந்து கைகளை தாழ்த்தி உடலின் அருகில் கொண்டு வரவும்.

தோள்பட்டை வெளிப்புற சுழற்சி



நேராக நின்று கைகளில் கனமான பொருளை ஏந்தி கைகளை பக்கவாட்டில், தோள்ப்பட்டையின் நிலையில் உயர்த்தி முழங்கைகளை 90° மடக்கவும். இப்பொழுது கைகளை கீழ்நோக்கி சுழற்றவும்.

சுவர் எதிராக பந்தை உருட்டுதல்

நேராக நின்று கைகளில் உள்ள பந்தை சுவற்றில் வைத்து அதை அழுத்தியபடி மேலும் கீழுமாகவும், வலது மற்றும் இடதுபுறமாகவும் உருட்டவும்.

ஒப்பிட்டு திறன் மூலமாக திறந்த சங்கிலி உடற்பயிற்சி மற்றும் மூடிய சங்கிலி உடற்பயிற்சி நுட்பங்களை பயன்படுத்தி சுற்றுப்பட்டை டென்டினோபதியினால் ஏற்படும் வலியை குறைத்தல் மற்றும் செயல்பாட்டு நிலையை மேம்படுத்துதல்

தயாரித்தவர்

அஜிதா.செ.த,

இரண்டாம் ஆண்டு,

முதுகலை இயன்முறை மருத்துவம்

பூ சா கோ இயன்முறை மருத்துவக் கல்லூரி